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THE MIND
AND ITS MECHANISM

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THE MIND AND ITS MECHANISM

with special reference to
IDEO-MOTOR ACTION, HYPNOSIS,
HABIT AND INSTINCT

and

THE LAMARCKIAN THEORY OF EVOLUTION

BY

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LONDON
KEGAN PAUL, TRENCH, TRUBNER & CO., LTD.
NEW YORK: E. P. DUTTON & CO.
1927

PRINTED IN GREAT BRITAIN BY THE DEVONSHIRE PRESS, TORQUAY

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PREFACE

The facts of psychology have usually been presented in a framework of physiological structure which gives an inadequate explanation of many mental phenomena. In this book we have endeavoured to set these facts in a psychical framework which to some extent remedies the defects of the purely physiological presentation. The conception of a "psychical structure" as part of the mechanism of the mind has been advocated by McDougall and other well known authorities. We have endeavoured to expand this more or less metaphorical conception by the hypothesis of a real psychic structure which is an essential part of the organism. The questions involved in psycho-physical interaction, in the integration of sensations and past experience, in the formation of Habits and Instincts, in ideo-motor action and hypnosis, in the operation of the "unconscious mind", and in the Lamarckian theory of Evolution can thus be examined in an aspect which greatly simplifies their inter-relations and affords a comprehensive point of view.

P.B.

W.R.B.

THE MIND AND ITS MECHANISM

CHAPTER I

INTRODUCTION

RECENTLY many physiologists and physicists have thrown grave doubt upon the view that the material brain is in itself a mechanism adequate for the various phenomena of mind which are recognized by psychologists. It is realized by some psychologists who are also physiologists that, in addition to the mechanism for the use of the mind which the material brain furnishes, some psychic mechanism must also be postulated to account for the observed facts. It is the nature of this psychic mechanism and its relation to the material mechanism of the mind which it is proposed to explore with the help of data derived from physiology, biology and psychology.

One of the chief characteristics of a living organism is its power to respond to sensory stimuli. To simple stimuli the response may be an automatic reflex response, but in the case of complex stimuli it seems to be necessary that these stimuli should be integrated or combined, and the response is not to the primary sensations but to the *meaning* which attaches itself to them. In *Body and Mind*[1] Professor McDougall has emphasized the importance

[1] Methuen & Co., Ltd.

of *meaning* in relation to response. For instance, he points out that various totally different sensory complexes having the same *meaning* elicit the same response, whilst sensory stimuli only slightly differing but different in meaning may elicit totally different responses. Thus the response to the statement " Your son is dead," would be the same if conveyed orally or by writing and in any language with which the recipient was familiar. The combination of sensory stimuli would be quite different, yet the meaning and the response would be unchanged. On the other hand the statement " His son is dead," though only slightly different sensorially, would have a totally different meaning and response. Professor Driesch observes (*The Crisis in Psychology*, p. 5).

" The most important, and, I may say, astonishing failure of the older and ' classic ' normal psychology had been the fact that it did not account for *meanings*, the *significance* in our psychical life—in fact a psychology which does not explain *meaning* and significance in the single acts of psychical life is a psychology which leaves unexplained the main points. The older psychology explained neither the one nor the other. For the only conscious contents which it registered were so-called sensations and images."

The importance of an organ which effects a synthesis of sensory stimuli and converts them into an idea or a meaning is clear. But much more than this mere integration is required for a suitable response. Suppose you observe a man take a pistol from his pocket, point it towards you and cry " Hands up," and there being a

stout tree near by your response is to jump behind it. Here you must have brought together the auditory stimulus " Hands up," and the visual stimuli—the man, his pistol, his attitude, his expression (if he is laughing the meaning may be entirely different), the tree near by, the space of ground between you. These are some of the auditory and visual stimuli. But in order to determine your response, you require much more which will be ideal and memorial. You must envisage the nature of a pistol and a bullet and its penetrative effect, you must have some knowledge or experience of what may ensue when a pistol is pointed at you by another person, you must have some knowledge or experience of the effect of wood in stopping a bullet, and so on. All these things together give a meaning to the incident and your response depends upon the meaning you infer. That is to say, you have to get into a focus the various sensorial stimuli, together with the relevant ideas and memories. Also, in addition, the organ which effects this synthesis must be suited to receive, retain and regurgitate the result of past experiences for present use.

Now many insist that in the human brain we have an organ which is adequate to do all this. Others hold that some immaterial organization or organ is requisite. Some organ undoubtedly exists, but whether it is to be found in the material brain or in some " immaterial psychic structure "—to use the language of Professor McDougall—is the question we desire to consider. We must have some name for the organ which performs these functions, whether it be the material brain or some part of it, or something

else, and since meaning and ideas involve psychological elements we will refer to it as a psychic organ—a designation which will be further justified in the sequel. This organ, whether part of the material brain or not, undoubtedly discharges the following functions :—

It receives and retains a record of past experiences.

It integrates sensorial stimuli into a unitary whole which expresses a meaning.

It brings this present unitary whole into a focus with past experiences.

Now let us go a little further down the life scale.

As a simple example may be cited the case of a dog which, when its owner takes his stick and puts on his hat, rushes out to accompany him for a walk. But if the dog has been guilty of some indiscretion, and his owner merely takes up his stick, the dog will slink away into the retreat of his kennel. Here the two stimuli are not very different, but the response is quite different. It is clearly the unitary *meaning* of the sensorial stimuli and their integration and comparison with the memory of past experience which determines the response. The behaviour of the dog indicates that it also is endowed with a psychic organ similar in kind though not in degree to that which man possesses.

We might cite many instances of the behaviour of animals and insects from which the inference may be drawn that they possess a psychic organ which discharges functions similar in kind to those of the human organism. But let us go to one of the lower rungs of the life ladder. Various naturalists have studied the behaviour of the

amœba, and Dr. E. G. Russell has summarized the result of their researches in his recent book *The Study of Living Things*.[1]

The amœba and other rhizopods project pseudopodia and use them to capture food in various characteristic ways, which indicate that the change in the environment to which it responds " is a change which has meaning for the animal."

Thus, the pelomyxa and amœba respond to stimuli caused by motile prey in a *prospective* manner. Their behaviour is adapted to a possible future contingency—escape of the prey (p. 72).

According to the position of the prey relative to its intending captor, and according to its possible lines of escape so do the methods adopted vary. " For example :[2] (1) When the motile prey lies below the pelomyxa, a curtain of protoplasm is dropped down about the prey, and then eventually the margin of the curtain closes beneath it to complete the formation of the food-vacuole ; (2) when the motile prey lies above the rhizopod, a cylindrical cup arises about it, the lips of this cup eventually closing above the captured animal ; (3) when the motile prey lies in the plane through which the pelomyxa is advancing, pseudopods are first sent out to each side of the prey, and when it is quite surrounded in this plane, overarching pseudopods form and finally the protoplasm closes in beneath it ; (4) if the prey lies between pseudopods

[1] Methuen & Co , Ltd., 1924.

[2] W. A. Kepner and J. G. Edwards, "Food-reactions of *Pelomyxa caroliensis*," *Journ. Exper. Zool.*, xxiv, 1917, p. 398.

it may be crowded towards one of the pseudopods by the expansion of one of them until the inter-pseudopodial space is reduced, when the two pseudopods take part in the formation of the food-vacuole ; and (5) finally, even a foreign body, such as a desmid, may become a conditioning factor in the reaction of the pelomyxa in meeting the contingency of the escape of the prey.

" The reference in the last sentence is to an actually observed occurrence when ' a chilomonas was playing in the bay formed between one side of pelomyxa's body and a desmid which lay in contact with the rhizopod. In response to this but one pseudopod was sent out which advanced to make a contact with the desmid. The direction of growth was changed in this pseudopod after it came in contact with the outer segment of the desmid, so that its advance was in towards the body-proper along the side of the desmid.' The response was here modified and simplified by the perceived presence of the desmid, which formed at first one wall of the prison constructed by the pelomyxa. A similar utilization of a foreign object to help them in a motile prey was observed by Kepner and Whitlock in amœba. On one occasion an amœba, advancing towards a large mass of detritus, became aware of a paramæcium lying between two of its pseudopodia and the detrital mass. The pseudopodia widened out and moved forward till they made contact with the detritus. A third pseudopodium grew out over the paramæcium and a pocket was formed in the body of the amœba at the base of the three pseudopodia, in which the paramæcium was trapped and ingested."

From these and other observations Dr. Russell infers that " what concludes the response is not the perception itself, but the meaning of the perception in relation to the hormic impulses active at the moment." He remarks that " It is clear also from a consideration of the whole behaviour that it is not the stimulus *per se* that is responded to but its significance." And again, " What is responded to is not the stimulus qua physico-chemical, but the stimulus as perceived and not merely the stimulus as perceived, but as interpreted. Response is really in relation to the meaning." Moreover, he also attributes to the organism a record of past experiences which is brought into comparison with present experiences.

Dr. Russell concludes : " From this review of the feeding responses of amœba and pelomyxa, as observed with care and without prejudice by skilled and competent workers, it is apparent how much simpler and more adequate is the psychological interpretation than the materialistic." It may be assumed that in his view the integration of sensory stimuli into meaning involves a psychological element. The functions which we infer from the behaviour of the amœba are such as might be discharged by a psychic organ similar in kind, though greatly inferior in degree, to that which discharges similar functions in the human organism. And the principle of continuity under these circumstances seems to indicate that right through the scale of life there will be found such an organ whose functions are similar to those discharged by the human psychic organ, however rudimentary such organ may be at the lower end of the scale.

It seems clear that in the evolution of mind the first step is the evolution of the machinery which the mind will have to use. This machinery appears to be of a twofold nature—the material brain, which brings the mind into contact with the world of sense, and the psychic organ which brings the mind into touch with the realm of ideas. We have no need to credit the amœba with a conscious perception of meaning. Without consciousness the integration of sensory stimuli and their interpretation may be expressed in such a way as to ensure an automatic response. The same psychic organ which performs the synthesis of present stimuli and past experience to produce a quasi-mechanical response, would serve a new purpose when consciousness "emerged," to use the language of Professor Lloyd Morgan. Then the synthesis would be carried into consciousness, and a new flexibility of response would arise. When consciousness intervenes between the synthesis and the response it becomes no longer mechanical. As an illustration, consider an apparatus so arranged that a message coded in morse signals carried by a tape will automatically produce a definite mechanical response. It would be easy to design such an apparatus. There would be a meaning in the message, and the machine, without knowing the meaning, would respond to it. But suppose the same series of signals is received before transmission to the mechanism by an operator, who reads and understands the meaning of the message and implements the response. The operator may bring other ideas to bear on the subject, and the response will have a flexibility which the machine could not impart. So with the syn-

thesis carried out by the psychic organ. If it passes into consciousness other ideas may be brought to bear upon it, and the response may be greatly modified. The principle of continuity seems to indicate that if the synthetic functions of the psychic organ are the same in the man, the dog and the amœba, the differences should be in degree and not in kind.

It should be observed that the function of the psychic organ seems to be to effect a synthesis of sensations and ideas and to transmit them, but it is only in consciousness that the meaning is apprehended. The message as it leaves the psychic organ may be compared to the message carried by the diaphragm of a telephone. All the vibrations and inflections of the speaker's voice are synthetized in the vibrations of the telephone disc. Mechanically the total message is there, but it is only when the message reaches consciousness that it can be said to have other than a mechanical meaning. If there is no consciousness, however, the integrated message still passes on to control motor activities. But the function of integration is still necessary though the " meaning " is only a mechanical meaning. We shall return to the question of " meaning " in a subsequent chapter.

The question of mental evolution, to which the recognition of a psychic organ of the kind above indicated has obvious applications, is dealt with by Professor McDougall in an essay included in a recent publication : *Evolution in the Light of Modern Knowledge.*[1] He observes (p. 334) : " Many of those who have written upon mental

[1] Blackie & Son, Ltd., 1925.

evolution and comparative psychology began their study by looking for indications of mental life in the lowest organisms, and, failing to find any such indications of an indisputable kind, proceed to search the scale of life from below upwards. . . . It is a sounder procedure to attempt to trace mind downwards in the scale, from man, in whom by common agreement we have the surest and clearest expressions of mind, endeavouring, by analysis of animal behaviour in the light of the analogy of human behaviour, to seize every indication of mental life, of purposive activity, as far down the scale as impartial observation warrants. When we follow this second and sounder procedure, we find good reason for inferring mental life in very lowly organisms, and some facts, which, supported as they are by the principle of continuity of evolution, indicate that even the simplest animals (perhaps even some plants), the unicellular protozoa, are not entirely without the rudiments of mentality."

This is the course which we have followed, the difference being that we find in this study of behaviour evidence of an organ which may serve the purpose of mind rather than evidence of mind itself. But we do not desire to emphasize this difference. It may be that consciousness emerged, not suddenly, but by gradual stages, *pari passu* with the evolution of more complicated automatism. In this case it would be proper to speak of "the rudiments of mentality," upon the assumption that consciousness and mentality are inseparable. Whether or no the automatic translation of a mechanically integrated "meaning" into action involves "the rudiments of mentality," it

seems clear that in either view the psychic organ has its functions.

Speaking of the "Development of Rudimentary Mind," Professor McDougall observes "such advance implies development of mental structure in the species." By "mental structure" we gather that he means what he elsewhere describes as "immaterial structure." Except that Professor McDougall seems to imply that this is a "structure of the mind," whilst in the view formulated above it is a psychical structure which, like the brain, is a mere organ of the mind, there may be little difference.

In discussing whether we ought to attribute "consciousness" to an amœba, Professor McDougall asks the question: "Would it not be wiser to content ourselves with postulating some such fore-runners of mind as Lloyd Morgan's passive sentience?" But he considers that this supposition "does but seem to soften and disguise the breach of continuity, by putting two smaller breaches in place of one large one." And he observes: "Mind is an active bridge or bond between the past and the future." But a psychic organ such as we have inferred is also such an active bridge. It is an organ which brings to a focus the sensory stimuli of the present and the memorial records of the past. We can conceive it as functioning without consciousness and as functioning with consciousness. And if it does not carry mind and consciousness to the bottom of the life scale, it does start the life scale with a psychic organ which serves the purposes of mind as evidenced by behaviour and which at a higher level is an absolutely necessary organ for the service of mind—

unless we consider it as part of mind. But this, by analogous reasoning, would lead us to consider the material brain as part of mind, instead of an organ of the mind.

The recognition of this psychic organ as a constituent of the lowest living organisms would obviously be of importance in theories of organic evolution. It has long been recognized that Darwin's theory of evolution must be supplemented in order to give a full account of the origin of species. In 1896 Wiessman suggested the theory of germinal selection, according to which the competition for nutriment among the determinants in the germ plasm played an important role. Professor Lloyd Morgan and Professor J. Arthur Thomson look on this theory with some approval, and A. R. Wallace in his *World of Life* (p. 273), says, after referring to Weissman's theory : " There is therefore both an internal and an external struggle for existence affecting all the special parts—organs, ornaments, etc.—of every living being." Professor McDougall remarks (p. 352) :

" It is now widely recognized that the strict neo-Darwinian theory of organic evolution is inadequate. This theory ignores mind or purposive activity as a possible agent of evolution, and strives to render an account of organic evolution, through the operation of selection alone, which shall consist with a purely mechanistic view of the world. It finds itself at the conclusion of its attempt with mind upon its hands as an enormous remainder or surd which cannot be intelligibly brought into the scheme, and yet which cannot be ignored, save at the cost of the absurdity of the whole scheme." And he concludes

(p. 354): "The only remaining possibility of assigning to mind the creative role which would seem to be proper to it is (so long as the Lamarckian hypothesis is untenable) to assume that the germ plasm itself, or the reproductive cells, have enough of mental activity to produce the variation upon which all selective processes must be supposed to operate and without which they can produce no evolution."

Here we see an inclination to throw upon the germ plasm an important function as regards the genesis and selection of the variations upon which evolution depends. If this psychic organ in a rudimentary form is itself a constituent of the germ plasm, it may serve the same purpose as "mental activity." For a psychic organ of the kind described would store up the experience of responses to stimuli, and these vary according to their success and also vary with varying environment.

Turning to the essay of Professor McBride in the same volume, we find another view. He recites certain experiments upon the inheritability of the effects of habits as to which he concludes (p. 242).

"We consider that these results of Kammerer and Durkhen are literally epoch-making for the theory of evolution in zoology, they show us evolution in action, and the main-spring of evolution, as Lamarck said over one hundred years ago, is the response of the animal to its environment, in plain language acquired habit." And he concludes (p. 261).

"We find that habit is response to environment, and that inherited structure is nothing but the crystallization

of the habits of past generations." To complete this picture we require the psychic organ which compounds stimuli and stores up the results of response to stimuli as the basis for the "crystallization of habits." We shall consider this matter further in our final chapter.

There is a growing tendency to seek for the fundamental explanations of life and mind in the interpenetration of physical and psychic factors. Physical scientists like Faraday, Kelvin, Clerk-Maxwell and Lodge, and many other distinguished physicists have been slow to follow biologists and psychologists in their attempt to bring life within the narrow bounds of the mechanistic science of purely material considerations. Recently Professor Soddy (*Cartesian Economics*, 1922) observes:

"I cannot conceive of inanimate mechanism, obeying the laws of probability, by any series of successive steps developing the powers of choice and reproduction, any more than I can envisage any increase in the complexity of an engine resulting in the production of the 'engine driver' and the power of reproducing itself."

He continues: "The biologist has first-hand knowledge of animate mechanism and seeks the origin of it in colloid chemistry. The test of it is not so much what the biologist as what the chemist has to say about it. The difference, to my mind, between dead and living matter is much as that between Niagara thirty years ago and now (between water falling according to the laws of mechanism or of 'probability' and water falling as directed and controlled by human purpose, human needs, desires and strivings) and it is not to be explained by the laws which Niagara

formerly obeyed, by the laws of pure probability, but by their opposite, the operation of intelligence."

While the material and mechanistic conceptions of the biologist fail to satisfy the physicist, it remains to be seen whether the latest revelations of the physicist in relation to the etherial constitution of matter may not help to bridge the psycho-physical abyss.

We pass on now to consider the nature of this psychic organ which upon physiological and psychological grounds we are led to infer in man, and which the principle of continuity would lead us to infer throughout the life scale. Obviously, it would be hopeless to look for it in an amœba from a physiological point of view. But the case is very different with man. The first place to look for it is in the human brain, which has been made the subject of minute physiological research. We shall take our data from Professor McDougall's volume on *Body and Mind*[1] in which he deals very fully with the subject from a physiological and psychological point of view. The philosophy of the subject, with which he also deals, is outside our present scope. He examines the operations of the mind with reference to the relevant apparatus which physiology has disclosed in the brain. He considers the question whether the brain is furnished with machinery which can perform various mental operations, or whether some entity other than the brain must be postulated in order to account for the facts. Upon a consideration of the psychological functions of the mind with the physiological ap-

[1] Methuen & Co. Ltd. We shall give references to the pages of the third edition.

paratus which the brain affords for their execution, he comes to the conclusion that the material structure of the brain, complex as it is, is inadequate for the performance of many of the mental processes involved. Thus (p. 197) :

" When two stimuli are simultaneously applied to the sense organs of any normal human being, they produce a change in his consciousness which is their combined effect or resultant. This composition or combination of their effects does not take place in the nervous system ; the two nervous processes are nowhere combined or compounded ; they remain throughout as distinct as if they occurred in separate brains, and yet they produce in consciousness a single effect, whose nature is jointly determined by both nervous processes. These facts can only be rendered intelligible by assuming that both processes influence or act upon some one thing or being, and since this is not a material thing it must be an immaterial thing. Our intellect demands this conclusion, and to refuse to accept it is to mistrust the human intellect in a way which amounts to radical Scepticism or Pyrrhonism."

Again (p. 298) :

" This psychic being, whose nature is thus partially expressed by the production of the unitary sensory content of consciousness in response to the manifold of cerebral influences, is that medium of composition of effects, that ground of the unity of consciousness and of psychical individuality, which the intellect demands and which cannot be found in the substance of the brain."

Again (p. 299) :

" The total sensory content of consciousness at any

moment is the complex reaction of the soul upon many such cerebral influences simultaneously affecting it. The brain processes could produce no sensations except by acting upon the soul, and their effects are combined in one consciousness only in virtue of their acting upon one soul."

Many writers have attempted to account for the composition of the effects of sensory stimuli. Lotze postulated a central cerebral organ containing a structureless jelly where sensory stimuli were to be compounded. W. B. Carpenter regarded the *optic thalamus* as such an organ. Herbert Spencer the *pons cerebri*. But, says McDougall (p. 288):

" The progress of our knowledge of the brain has shown conclusively that there exists no one part in which all sensory paths converge and which might be regarded as a *sensorium commune* in the sense defined above. It has been shown on the contrary that the tracts of fibres ascending to the brain from the sense organs of different functions pass to widely separated portions of the cerebral cortex, the sensory areas, and that the various qualities of sensation depend upon or are evoked by the processes of these several areas."

And after discussing other suggestions for a physical medium of composition, McDougall concludes (p. 289) that they are purely speculative, and that no particle of evidence directly supporting any of them can be adduced, and asserts confidently " that there exists in the brain no such physical medium of composition, and that the processes of the several sensory nerves simultaneously

excited do not affect any common *material medium*[1] to produce in it a complex physical resultant."

By way of illustration McDougall considers in detail the phenomena of binocular vision, and the brain structure concerned therein, and shows that (p. 293) :

" The fusion of effects of simultaneous sensory stimuli to a unitary resultant is not a physiological or physical fusion or composition ; but a purely psychical fusion, the unitary result exists only in the psychical sphere."

Again Professor McDougall (p. 268) shows how the mere sensory impression on the physical brain is incompetent to account for the psychical reactions which follow. Sensory reactions which are only slightly different may give rise to utterly different meanings and reactions, as to which he gives the illustration before cited as to the different responses evoked by a telegram, " Your son is dead," in any language known to the recipient, and by the words, " My son is dead." In his view such considerations show the impossibility of a mechanical conception of human behaviour. The reaction of the organism to the sense impressions " bears no specific relation to these, but only to the meaning which is suggested by them." He concludes that (p. 305) " this psychical whole, the meaning of the sentence, has not for its physical correlate in the brain a corresponding unitary whole," and that " there exists no unitary neural process correlated with meaning."

In the discussion of Memory he finds (p. 337) " independent evidence of the truth of the view that meaning is a

[1] Our italics.

purely psychical product of psychical activity," and concludes that (p. 342) meaning " is just that all important factor in mental process to which we can assign no immediate physical correlate among the brain processes."

As to Memory, the considerations which he brings forward (p. 342) " point to a view of the conditions of memory or mental retention intermediate between the two extreme views that have long been opposed to one another, the view that it is wholly conditioned by neural structure, and the view that it is conditioned wholly in some immaterial fashion." And he concludes (343) that " if meanings have no immediate physical correlates or counterparts in the brain, and if the meanings themselves do not persist, we must suppose that the persistent conditions of meanings are psychical dispositions. We must believe then that there persist psychical dispositions, each of which is an enduring feature of the psychical structure."

The above, with other considerations, lead Professor McDougall to the conclusion that there is " some immaterial thing " which performs these functions which the material brain is incompetent to perform. As to the nature or constitution of this immaterial thing or psychic being he makes no speculations. The hypothesis which it is desired to consider differs in some respects from the conclusions of Professor McDougall, or perhaps it would be more correct to say that it extends them. He speaks of " psychical dispositions " and " psychical structures " as if they were part of the mind or soul. The object of

this essay is tentatively to formulate the hypothesis that this " psychic structure " is in the nature of a psychic organ interposed between the material brain and the mind. It seems to us that Professor McDougall's conclusions lead directly to the postulation of a psychic organ which performs *inter alia* the function of integrating and compounding the complex sensorial impressions of the material brain, and which has a structure capable of being modified by experience in a more or less permanent manner. To use his language, these complex sensorial impressions must " act upon one thing or being, and since this is not a material thing it must be an immaterial thing." The complex sense impressions in his view are integrated and " their efforts are combined in one consciousness only in virtue of their acting upon one soul." Upon the hypothesis we are to consider there is an integrating apparatus which is not the mind or soul itself, but an intermediate organ, having an adequate structure which performs this function, probably throughout the whole range of animal life. McDougall uses the phrase " structure of the mind " (p. 330) " to denote comprehensively the sum of those enduring internal conditions by which the play of mental process and the mode of behaviour of an organism are determined at each moment of its life." As to this he postulates " that experience modifies the structure of the mind, and that it is through the persistence of these modifications that past experience influences present behaviour and present mental process. Some part of the structure of the mind is innately determined or inherited." And he finds that the materialistic assumption " that the struc-

ture of the mind may be fully described in terms of cerebral structure " is untenable.

Without in any way dissenting from the view that the mind itself may have a " structure," we shall endeavour to show that the postulation of an intermediate psychical structure, which, like the material brain, is merely an organ of the mind, not only satisfies the required conditions for unity of consciousness but is in accord with various other psychological phenomena and gives a coherent explanation of them. We shall speak of this intermediate psychical structure in the case of man as the psychic brain and regard it for the purposes of our hypothesis as co-operating with the material brain. This is our main hypothesis and the main lines of the argument do not depend on details as to structure. But we shall nevertheless condescend upon hypothetical details for two reasons—first to indicate that there are known physical agencies and analogies which may help us to rationalize the *modus operandi*, and next, because, though such detail is not necessary to the argument, it provides a skeleton which will enable the conception to be appreciated more readily.

The problem of psycho-physical interaction has engaged the attention of physiologists, psychologists and philosophers. It has been alleged that there is a gap, a deep chasm as it were, between the psychical and the material, and that a bridge could not be found. But the advance of science leads us to suspect that there is really no gap ; that in fact, the psychic and the material are in the territory between them both physical. Having arrived at the conclusion that physiology and psychology both require

us to postulate an "immaterial structure" which is the carrier of permanent "psychical dispositions," we can conceive of such a structure on a purely physical basis. Physical science has taught us to recognize the essentially etherial constitution of matter, and the ether is physical and yet immaterial. In the ether we recognize the fundamental substance of the universe, and as it is the foundation of material phenomena, and the very substance of matter, we shall also postulate it as the foundation of psychic phenomena and of the "immaterial substance" and the "psychic structures" which McDougall envisages.

Etherial protons and electrons we know as the constituents of matter. As the basis of the "immaterial substance" we may postulate a second order of "ons" which are, like protons and electrons, fashioned out of the ether. Let us call these "ons" by the name of "psychons." What then do we mean by "immaterial?" Simply that the mass of a psychon is of the second order of small quantities compared with the mass of an electron —so small as to be inappreciable by the methods by which we appreciate the mass of a material atom. We know that the mass of an electron is only the one thousandth part of that of a proton. There is therefore no difficulty in conceiving that the mass of a psychon may be one thousandth part of that of an electron, or so much smaller as to be inappreciable by our methods of measurement of material masses. Hence we may be content to classify it as "immaterial." Possibly, as with electrons and protons there may be two kinds of "ons" but it will suffice to describe both as psychons. On this hypothesis matter and

the "immaterial substance" both belong to the physical realm and the gap has disappeared. We conceive therefore of psychons as being in the physical realm, though immaterial, but they may also be regarded as being in a borderland which connects the physical and the psychic.

We shall suppose the psychic organ, whether in man or the amoeba to be built of psychons which constitute an immaterial structure interpenetrating the material structure. In the material structure there is plenty of room for it, since (say) 99.999 per cent. of ordinary matter is "empty space," that is, space occupied not by the etherial protons and electrons, but by undifferentiated ether. To designate the substance of this psychic structure we may use the term psychoplasm. Psychoplasm, of which the unitary components are psychons, we regard as the psychic analogue of protoplasm, of which the unitary components are protons and electrons. We regard psychoplasm as being like protoplasm coherent and continuous and capable of forming complex structures, adapted to carry out the various purposes for which psychic structure is postulated. And it may be found that the conception of such a psychic structure even in the germplasm, as carrying the psychic factors of heredity, may help towards a more satisfactory account of the evolutionary process than has yet been attained. While we thus concretize our hypothesis in order to work it out more thoroughly, the detail is an accretion to the main hypothesis which is capable of modification. There have been many attempts to set the facts of biology and psychology in a purely physiological framework. We shall endeavour to set these facts in a

framework of psychic mechanism based on the conception of a substance, immaterial, yet supporting a real, instead of a merely metaphorical structure. Although the details of our mechanism are hypothetical the use of such a framework may suggest new relations between the facts and new possibilities for their rationalization.

Since the above was written our attention has been called to an address by Sir J. J. Thomson on " The Mechanics of the Electric Field," which is reported in *Nature* for 4 September, 1926. It appears that there are certain discrepancies between experimental facts as to atomic structure and the deductions which arise from the mathematical equations which apply to an electric field. This discrepancy leads to a conception which, in the opinion of Sir J. J. Thomson, " involves the existence in the universe of a structure beyond that represented by electrons and positive particles. . . . This structure must be far finer in texture than the electrons ; thus, on this view the electron does not represent the last word in minuteness, and there are still smaller entities awaiting discovery by the physicists. . . . Without committing ourselves to the reality of this particular structure, we may liken it to a sub-atomic and sub-electronic gas, the particles of which are much finer than the electrons." And in conclusion Sir J. J. Thomson says, " These considerations suggest that just as matter is made up of molecules, and molecules are made up of electrons and positive particles, this is not the end of the story ; there are still other worlds to conquer, the worlds which build up the electrons and positive particles."

It is not a little remarkable that considerations based on electro-magnetic phenomena and considerations based on physiology and psychology, should both lead to the conception that there are still smaller entities which are much finer than the electrons.

SUMMARY

From the highest living organism right down to the type of the amœba the response to sensorial stimuli appears to depend upon the apprehension of "meaning." This depends upon the integration and interpretation of a complex of stimuli in conjunction with the results of past experience and involves a synthesis for which the material brain affords no mechanism.

Experience has to be registered in such a way that it can be recalled. Memory involves "the persistence of psychical dispositions each of which is an enduring feature of the psychical structure." "Experience modifies the structure of the mind." The assumption that "the structure of the mind may be fully described in terms of cerebral structure" is untenable.

We are thus led to examine the hypothesis of a real psychic structure pervading the protoplasmic structure of an organism. The substance of this structure we may call psychoplasm. It must be so organized as to be capable of integrating sensations, of recording experience, in such wise that the results of past experience can be recalled in

juxtaposition with present sensations. This leads in man to the conception of a psychic brain co-operating with the material brain.

As to the possible basis of psychoplasm we may take the analogy of the etherial protons and electrons which constitute matter and postulate analogous etherial units of a finer order which may be called psychons. Just as protons and electrons are aggregated into protoplasm it is suggested that psychons may be aggregated into psychoplasmic structures.

The protons and electrons which constitute a protoplasmic structure are widely spaced apart, and hence there is no difficulty in the way of the conception of an interpenetrating psychoplasmic structure.

Psychoplasm may be regarded as a constituent of every living cell, including the germ plasm, and also as capable of constituting psychic structures comparable with the complex structures which are built out of protoplasm.

Protoplasm and psychoplasm are thus regarded as "concomitants," the one carrying the physical basis of life, the other carrying its psychical basis,—both interacting.

Upon this view of living structure the difficulties of psycho-physical interaction disappear. Electrons and psychons both belong to the physical realm. Psychonic substance or psychoplasm is regarded as being of mass so small as to be practically inappreciable.

CHAPTER II

CONSCIOUSNESS

We must leave to philosophers the task of speculating on the constitution of the mind. The mind is stirred by emotions of love, hate, fear, anger, jealousy, admiration and so on; it entertains beliefs, prejudices, ideals, convictions; it thinks and judges, and behind it lie the sources of volitional action. But it requires certain mechanism to present the materials for thought and it is with this mechanism that we are chiefly concerned.

It has been seen that we propose to refer to a definite psychic organ some of those functions which Professor McDougall finds cannot be performed by the material brain and which he attributes broadly to the mind or soul or some "psychic being." The material brain receives sensorial impressions, and according to the view to be presented, it is the function of the psychic organ to integrate or compound these sensorial impressions and to bring into consciousness the resulting ideal impressions, together with the stored-up results of past experience.

Psychologists often speak of the "machinery of the mind." Freud imagines a little demon there which he calls the "Censor"—something like Maxwell's demon, which opens and shuts little doors to admit or oppose the passage of ideas. We may accept the phrase "machinery

of the mind" if it implies, not that the mind is itself a machine, but that it has at its disposal a structure or mechanism which integrates sensations into ideas, sorts out ideas by associative linkages into groups and presents them to consciousness for the judgment of the mind or decision of the ego upon the materials presented. We are not concerned with an explanation of the faculties of the ego or mind itself, but only with the organs which furnish it with mental pabulum, and not with the way in which the mind operates upon these materials. But in the view presented, the material and psychic brains are not thinking machines unless we include "unconscious cerebration" in the word thinking. The mind alone does the sort of thinking which involves judgment.

There have been many theories of consciousness, from that which regards it as a kind of energy to that which supposes it to be a kaleidoscopic arrangement of psychic molecules. It is important to have a clear idea of what we mean by consciousness, for the meaning has been obscured by the promiscuous use of terms such as pre-conscious, subconscious, unconscious and so on. For our purpose, consciousness may be defined as the awareness of the ego. There are different degrees of awareness, from a condition in which the mind is concentrated on one idea to a condition in which an idea is too vague and evanescent to be clearly defined. But these seem to be differences of degree and not of kind.

It has been said that "awareness" is not sufficiently expressive or inclusive, and that the mind is not aware of the greater part of consciousness. But this is for us a

question of definition. We do not include in consciousness the vast storage of ideas and events which is accumulated during life. Of this unconscious storage, only the part drawn out at any time is in our view present in consciousness.

Consciousness in this view is a picture of ideas presented to the mind which may be compared with the picture presented in ordinary vision. Indeed, we can best think of consciousness in terms of a picture presented to the " mind's eye," made up of a number of ideas which are seeking expression. We know that ideas are presented to the mind in consciousness. We know that they are scrutinized by something in the mind. If, with Hamlet, we call this something in the mind the " mind's eye," we shall not be straying far from psychological facts.

It may be suggested that the " mind's eye " is a poetical conception, unworthy of scientific application. But we venture to think that this conception will clarify our notions of the working of the mind better than any other. If we were to frame for it some imposing word of Latin or Greek derivation it might be more acceptable to some, but we propose to use the simple words " mind's eye " in their easily understood meaning. The ego has the capacity of focussing attention on one of a group of ideas and holding it there. What this " eye " may be like we cannot imagine but the notion of the mind's eye focussed on ideas presented in the field of consciousness is a strictly scientific notion because it is strictly in accord with the facts of experience, it will provide a simple explanation of some phenomena, and it has the advantage of being intelligible.

In ordinary vision the eyes are focussed upon one point, or small area, which, for the moment, is the centre of the picture. If the eye is kept steadily fixed on this point we see the surroundings less distinctly. Circumferential details in the margin of the picture escape us, though their general outlines are in the picture and we have some appreciation of the whole picture though the parts more distant from the centre of vision are little appreciated. But the eye turns rapidly from point to point in the picture and so gets a further appreciation of the relation of the parts which completes the appreciation of the picture as a whole.

There are one or two psychological facts which we can discover by introspection which show a very close analogy to physical vision.

1. When the attention of the mind is strongly directed to a particular idea it is momentarily partially isolated and assumes prominence among associated ideas.

2. An idea may be particularly energetic or pushful or recurrent so that it assumes, as it were, of its own accord, prominence among associated ideas.

3. An idea which is for any reason specially prominent in consciousness tends to displace less prominent ideas.

Now let us express these facts in terms of the picture in consciousness and the mind's eye.

When an assemblage of ideas is presented in the picture of consciousness the mind's eye is naturally focussed on the most prominent idea in the picture. Other ideas in the picture are to some extent displaced or less distinct. But the mind's eye can rove from one point to another, thus getting an appreciation of the several ideas of the

mental picture which gives an appreciation of the group of ideas *as a whole.*

Were it not for this presentation in consciousness of a picture, we should be in the position of a blind man who has to feel all over a statue in order to get some idea of the whole, and even then has not the same appreciation of it as the man who can see. Without adequate psychic apparatus for this purpose we should be in the position of the blind man, but the psychic organ which we postulate serves the purpose of simultaneous presentation. Through some such organ we may obtain a complete picture both of the objective and the psychic content of a subject. We can focus the mind's eye quickly on one aspect and another of the whole so that we get not merely separate details but the appreciation of a complete picture, and the ego can see the relation of the parts to the whole.

Again, if the eye be focussed on one point of a scene, there is a certain small area round the point which is perceived almost equally clearly throughout. The size of the area clearly perceived without moving the eye depends upon the angle which the area subtends at the eye. Thus if at a sufficient distance the eye is focussed upon the nose of a face, one may see all the features sufficiently clearly. So with ideas. The idea upon which the mind's eye is focussed in the centre of the picture in consciousness may have ideas closely linked to it which are simultaneously perceived, without, as it were, shifting the centre of vision of the mind's eye.

As an illustration of ideas which are on the margin of the picture or just outside it may be instanced the typical

case of a writer who is unconscious of the ticking of a clock in the room. There is a sensory impression of the ticking which has not emerged in consciousness. But if the clock stops the mind's eye is at once diverted to the memory trace of the ticking and temporarily focusses on this memory trace to the interruption of the stream of ideas flowing from the pen.

In Chapters IX and XI we shall consider the part which the relative energy of ideas plays in forming the picture in consciousness and also the rôle which is played by conflicting ideas.

To further illustrate the assemblage of ideas in the field of consciousness we may take the case of an *extempore* speaker, who is replying at the end of a debate on a political question. He has to bear in mind the facts and arguments which have been brought forward. He must also have in mind the counter facts and arguments upon which he intends to rely. He has in mind various analogies and metaphors, which may serve his purpose, which association brings to the surface. And he may also have in mind his own preconceived opinions. There must be some organization which enables him to place these various facts, arguments and analogies, etc., side by side in the field of consciousness so that he may sort them out whilst he is speaking and call up the appropriate words for expression of the synthetic line of argument or rhetoric which is the resultant of this mass of ideas. According to our hypothesis it is the psychic brain through which these ideas can be presented to consciousness so that the ego may make a definite selection of them to be rendered into words. It is

difficult to frame any conception of the *modus operandi* on a purely material basis.

Furthermore we need to differentiate between the state of mind of an orator who is speaking and the state of mind of a thinker who is comparing and criticising and forming a decision or opinion. The difference may be illustrated by comparing the cases of an advocate who is endeavouring to persuade and a judge who is listening in order to arrive at a conclusion. The orator or the advocate has usually a definite end in view. He may balance rival considerations, but he is usually striving to form in the mind of a listener definite conclusions or to stir to definite action. The judge is also balancing rival considerations but with the object of criticism and comparison in order to arrive at a true decision. In the case of the advocate he is endeavouring to sort out the materials and to present them with an emphasis directed towards the conclusion he wishes to enforce. His mind must be active in the comparison of relevant materials, but with an end in view he directs the mind's eye to one set of materials so as to push the others into positions on the margin of the field of consciousness, or into positions where some counter consideration is more prominent And if he thus succeeds in persuading himself that the conclusion he is urging is undoubtedly the right one, he will be the better advocate.

On the other hand the judge has to put rival considerations side by side in the focus of consciousness so that they may be criticized and compared. His volitional attention is directed to one consideration after another with the result that certain of them are left near the centre of the

field of consciousness and others are relegated to the margin or pushed out of sight as irrelevant. So by this process of criticism and comparison he arrives at the final picture in consciousness in which the relevant considerations have received new linkages which group them into a whole by which the final decision is determined.

To this judicial condition of the mind we propose to refer as the *judex*. It may be compared with Freud's notion of the "*Censor*," but the censor seems to be an expression of the effect of the pleasure-pain principle, which operates to disturb the action of the judex. The judex is only operating at its highest when feeling affects can be pushed out of the field. Objective materials which are supplied sensorially and subjective materials which are the results of experience form the grounds for a decision. But the judex is rarely free to decide quite impartially. The human mind is so constituted that its decisions are always influenced by determinants which have been stored up. These when so powerful as to deflect the operation of the judex rank as complexes, and they may be such as to help or hinder sound decisions. Complexes and hypnotic suggestions both tend to oust the judex and cause a decision or opinion to be unduly swayed by feeling affects.

Consciousness then is in this view the awareness of the ego of the picture of ideas and sensations which are simultaneously presented to the mind, so that the ego can perceive them in their relation to one another and form a judgment or decision upon the materials so presented. In the hypothesis which we are examining these materials, so far as sensory impressions are concerned, are passed

on from the material brain, and together with ideas, analogies, metaphors and other relevant psychic matter are presented in consciousness by the psychic brain. Voluntary attention changes the relative energy of the ideas forming the picture. It is important to note that the picture is a constantly changing picture. The idea which is for the moment in the centre of vision has other ideas grouped around it by associations. Change the centre of vision to a neighbouring idea whose associated ideas will be slightly different and those new ideas become more prominent displacing others less strongly linked. So as the "mind's eye" roves from point to point of the picture, the picture itself changes in detail because of the changes in associations. Concentration means keeping the main idea or the end in view always near the centre of the picture. These are facts which can be verified by introspection.

It will be realized that objective facts are also normally in the field of consciousness as well as subjective ideas and that the resultant decision of the mind depends upon what ideas are grouped in the centre of the picture either by their intrinsic energy (as to which see Chapter IX) or by the voluntary action of the ego in shifting the point of vision.

The margin of the field of consciousness is, like the margin of the visual field, not a sharp line. If we sit in a room with the eyes fixed on one prominent point, and, without shifting the line of vision, try to realize the shape of things in lines nearly at right angles to the line of vision, only patches of light and shadow and nebulous shapes are

discernible. So on the margin of consciousness, vague emotions and ideas which we vainly endeavour to define may be found. And to cover all the phenomena we shall find it necessary to conceive that quite beyond the margin of consciousness may exist ideas on their way to consciousness in this outer area, which may not reach the margin and nevertheless play a part. This extra-marginal area of the field is often spoken of as sub-conscious. We shall consider later the activities which may proceed in this region.

Our view of consciousness as being merely the awareness of the ego differs from a use of the word which seems to identify consciousness with the ego. For instance, Lloyd Morgan, in his *Habit and Instinct*,[1] to which we shall have occasion to refer later, compares the function of consciousness with that of a drill serjeant who takes in hand a number of raw recruits. He says (p. 144) :

" It is the function of consciousness, represented in the flesh by the cerebral cortex, to drill and organize the active forces of the animal body in a somewhat analogous manner. . . . The horseman, the billiard player, the pianist, knows well that, when once skill has been attained, such further guidance as is required under the special conditions of any particular occasion, may be safely left to sub-consciousness, scarcely troubling the attention at all. Habit has in large degree rendered these actions part of the required automatism. But consciousness, like a wise superior officer, still keeps vigilant watch. So long as the performance is satisfactory and accurate the superior officer sees as if

[1] *Habit & Instinct.* Published by Edwin Arnold.

he saw not ; but when anything goes wrong, consciousness, as superior officer, steps in more or less smartly and decisively."

This may be regarded as a mere difference of terminology, but in our view it is the ego which is the directive agent, which decides in view of the materials which are presented in consciousness.

Again in discussing the relation of organic to mental evolution, Lloyd Morgan observes (p. 275) :

" Before the introduction of consciousness as a factor in progress, organic evolution is dependent entirely upon the directly responsive adjustment of the plastic organism to the environmental influences. If consciousness accompanies this adjustment, it is merely as an adjunct without power of guiding. It is like the passenger on a ship, that is aware of her evolutions, but is absolutely without control over them. . . . But with the advent of effective consciousness there is developed in association with the organism a special organ, dependent on, but exercising control over, the rest, by which it is enabled to profit by experience. . . . Consciousness is no longer merely a passenger in the ship of life. We may rather liken it to the captain of a modern ironclad, who, seated in the conning tower, directs all the movements and all the actions of the ship under his command. He alone is in possession of the requisite data for working the vessel."

Here again in our terminology it is the ego which is the captain, to whom are presented in consciousness " the requisite data for working the vessel." The point at which consciousness becomes " effective consciousness " is the

point at which the organism becomes capable of making a choice between alternatives. The observations upon amœba and pelomyxa which we have cited appear to indicate the possibility that even such a lowly organism may be able to make such a choice. We may attempt in a somewhat nebulous way to utilize Lloyd Morgan's analogy of the ship's captain in order to adumbrate the attributes of the individual. Thus we may say that the mind is the individual considered as a thinker, whilst the ego is the individual considered as a director—making a voluntary choice between alternative courses and so steering the ship. Consciousness is then a sort of camera obscura picture of the mental landscape. The mind's eye is the attention of the observer directed to features of the picture. The judex is the advisory attribute of the individual when conning the picture. The ego is the executive attribute, steering the course. We say the judex is advisory and not executive, because the ego need not follow the judex. For instance, in the field of morals the ego may implicitly say "*video meliora proboque, deteriora sequor.*"

We have laid stress on this matter in order to indicate that in our use of the word *consciousness*, we refer only to the "awareness of the ego."

SUMMARY

The mind of man has two correlated sets of mechanism at its command, viz., the material brain with its machinery

for receiving sensory impressions and the psychic brain adapted to synthesize these impressions together with mnemic ideas and present them as a picture in consciousness.

Consciousness is the awareness of the ego which comes through the picture of ideas placed before the " mind's eye." Objective facts as well as subjective ideas are presented together in the picture.

The mind's eye may rove from point to point of the picture in consciousness, thus getting a comprehension of the picture as a whole. Or the mind's eye may be focussed on a group of linked ideas in the centre of the picture, thus only dimly apprehending surrounding ideas, whilst ideas on or beyond the margin of the picture escape the awareness of the ego.

The focussing of the mind's eye upon an idea tends to bring it into the centre of the picture. Thus the voluntary action of the ego or the intrinsic energy of the idea may bring any of the materials into the centre of the picture, or push them to the margin.

This simultaneous presentation of ideas enables comparison, selection, and rejection or appropriation. An advocate selects from the data with the end in view of a particular proposition. This attitude of mind is to be contrasted with that of a judge, who should arrive at a conclusion upon all the data. To such a judicial condition of the mind we refer as the *judex.*

Complexes and hypnotic suggestions tend to energize and centralize special ideas and produce a configuration of the picture which deflects the operation of the judex. The

final picture produced by the relative energy of the ideas and by the voluntary action of the ego determines action or opinion.

But ideas outside the margin may be so energized as to have their influence in the composition of the picture.

CHAPTER III

THE PSYCHIC ORGAN

We propose then to consider the hypothesis of a " Psychic Structure " other than the mind itself which shall perform some of those functions which the material brain is not capable of performing, viz., the integration of sensations, ideas and memories for which, as McDougall tells us, there exists in the brain no physical mechanism of composition and no common *material* medium to produce the complex resultant. According to Professor McDougall it is to be an " immaterial structure " which can retain permanent " psychical dispositions," and which can " produce a unitary sensory content of consciousness in response to the manifold of cerebral influences "—a process " to which we can assign no immediate physical correlate among the brain processes," since " there exists in the brain no such physical medium of composition." We shall refer to this structure in man as the " psychic brain."

Not being able to attribute these functions to the material brain, we gather that McDougall assigns them to the mind or soul. So far he negatives the idea that the mind is a mere function of the brain and assigns to it a structure which performs functions which the material brain cannot perform. But as the mind is dependent for its present apprehension of sensations upon the material brain so we

conceive that it is not without some correlative psychic organ for the apprehension of the ideas to which the experience of the past gives rise. The automatic synthesis of a complex of sensations, which are not separately apprehended by the mind, seems to demand some mechanism which may gather them together and pass them on to the mind as an idea, or group of ideas, the meaning of which the mind can apprehend. And especially is this so when we consider that the sensations must be combined with pre-existing ideas in order to furnish forth their full meaning. Have we any data which will enable us to push the mystery of psycho-physical inter-action a little further back ? It is true that even if we succeed in reducing the area of the mysterious we must finally come up against the mystery of the mind itself. But if we can envisage any mechanism which will help to bridge the gap between the material brain and the mind, it will be so much to the good.

Now the first problem to be solved, if solution is possible, is as follows :—How can a complex of sensory impulses conveyed to nerve endings situated at scattered points in the cortex be brought together into a psychic focus and compounded, in the absence of any material set of communications. There appears to be only one physical agency by which this unification can be effected, viz., vibrations radiated in a medium. We are familiar with the effect of these in two cases. For instance, the notes of the different instruments of an orchestra are combined by vibrations radiated through the air and received either by the human ear or by a microphone, and though coming

from different places they are *all combined at every point within range of the sounds*. You may be sitting either in the area or the gallery of the Albert Hall and all the sounds of all the instruments will be combined in your ear. Here is a perfect example of the synthesis of a complex of scattered stimuli into a unitary whole. It is true that a musical ear can pick out the various elements of the complex and recognize the violin, flute, trumpet, and other kinds of instruments. Yet undoubtedly a synthesis is effected of the total harmony, proceeding from separate scattered instruments and carried by radial vibrations through the medium to every point, so that wherever an ear is situated, there a synthesis takes place. Of course this only serves as an analogy, but the second case of the physical synthesis by etheric vibrations may give us more than an analogy.

To simplify the illustration of this second case, suppose you have (say) three wireless broadcasting stations all in tune with your receiving apparatus and sending out, let us suppose, three simple notes, one sending out C, another E, and the third G, these will be combined in your receiving apparatus into the chord of C E G, and that wherever your receiving apparatus may be located within range of the sending stations. Both for aerial and etheric vibrations the synthetic result depends upon the presence of a medium through which the vibrations radiate. So long as there is a uniform medium through which the vibrations can radiate without distortion a synthesis is effected at every point where there is an instrument capable of receiving the vibrations. Now we may conceive of the psychic brain

as distributed through the open atomic network of the material brain, though this is not essential. In any case the material brain and the psychic brain are both bathed in the ether, which separates them and yet links them by etheric vibrations, without the necessity of any distinct paths such as nerves. Matter is composed of electrons and protons, forming atoms and molecules which are themselves separated by the ether and through which, though widely spaced apart, they act upon one another. The protons and electrons which constitute matter are held to be modifications of the ether. Thus matter being itself etherial can act upon the ether. If we suppose the psychic brain to be also composed of etherial constituents which form an immaterial substance such as is postulated by McDougall, we have at once the possibility of a synthetic mechanism capable of uniting a complex of sensations into a unitary resultant.

According to our hypothesis the nerve endings in the cortex set up etheric vibrations which are sent out radially, through the ether, without the necessity of any definite paths. These etheric waves pass to the psychic organ and by it are taken up and passed on in a unified form to consciousness. We know of no other physical agency which is capable of filling the gap between the material brain and the psychic organ and so combining a complex of scattered sensations and passing them on in a unified form to the mind.

Of what may be the nature of the " psychical structure " to which we refer as the psychic brain we have no knowledge. A structure cannot be conceived without a sub-

stance which builds the structure. As this substance is to be immaterial it cannot be composed of protons and electrons, but we may regard it as being built of some other " ons " to which we have given the name of psychons, and the immaterial substance built of psychons we may call psychoplasm. As this psychic structure is to be capable of changes in structure, we must regard it as being subject to some kind of etherial metabolism like the material brain. The hypothesis of the psychic brain as a " psychic structure " composed of an immaterial etherial substance, which seems necessary to satisfy the problem formulated by McDougall, takes us on the road towards a solution of the problem of psycho-physical interaction. The difficulty has been the chasm between the physical and the psychic. But the recognition of the etherial nature of matter enables us to postulate an etherial apparatus of protons and electrons on the material side of the chasm and an etherial but immaterial apparatus of psychons on the psychic side of the chasm, both being bathed in the ether which bridges the chasm and both being capable of responding to etherial vibrations. Both the substance of the psychic brain and the mode of integration of sensations by etheric waves are thus to be regarded as being in the physical realm.

To fulfil the functions which Professor McDougall assigns to " psychic structure " the psychic brain must consist essentially of two departments—active and passive. The passive department is the retentive portion of the psychic brain, in which memories, ideas, determinants and complexes are stored. This retentive department we propose

to call the *mnema*. Ideas in consciousness tend by association to draw into consciousness from the mnema linked ideas relative to ideas in consciousness. This storage in the mnema is identical with that to which reference is often made as the unconscious, or less correctly as the "unconscious mind," since the mnema is more properly regarded, not as mind, but as part of the mechanism which is at the service of the mind. We must devote a further chapter to the consideration of the mnema.

The active department of the psychic brain we propose to call the *exchange*. In our view the physical and the psychical only interact through the ether. There is nothing broadly new in this conception, since physical science has already brought us to the conclusion that matter itself can only act on matter through the ether. That is to say, protons and electrons do not touch one another. They act on one another by etherial stresses. We only carry the conception one stage further when we say that the protons and electrons of the physical brain cannot act upon the psychic region except through the ether, and upon the immaterial "ons" which constitute the psychic brain. So in our view all sensations penetrate into the psychic region through the exchange. We regard the exchange as a psychic structure which picks up and responds to the sensory impressions coming from the material brain and carried by etheric waves. At the same time, it has to draw from the mnema the results of experience in order to amplify the sensory impressions. It, therefore, has to effect a synthesis not only of the sensory materials, but also of the relevant ideal materials which are furnished by the mnema.

But we regard it also as active analytically as well as synthetically, as for instance in resolving a motor-idea involving complex muscular action into the necessary motor impulses to various muscles. (See Chapter VI). The *raison d'être* of the conception of the psychic brain is the necessity for its synthetic function. But its necessity for ideo-motor action seems also clear. Without impairing the generality of our hypothesis we may regard the exchange as a department which may not only effect the synthesis of a complex of sensations but may serve for the analysis of an idea which to be implemented requires a complex of motor impulses.

The subject of idea-motor action will be dealt with later, but we may observe that when the necessity for such an organ as the psychic brain is apparent it must stand altogether as the bridge between ideas which are psychic and nervous activities which are physical, whether for composition or resolution.

The extraordinary arithmetical powers possessed by a few persons must be assigned to the action of the psychic brain. There are well-attested cases of persons who had a super-normal arithmetical faculty. They could almost instantaneously give correct answers to the multiplication of two sets of numbers of four figures each, and, what is more remarkable, give correct square and cube roots of numbers involving many figures. The only reasonable explanation of this is that the psychic brain involves a mechanism by which these processes could be achieved, developed in these cases to an abnormal degree, but of the intimate nature of this mechanism we have no conception.

There is also the case of the Elberfeld horses which seems to be well attested, and was investigated by Professor Claparede of Geneva, Maurice Maeterlinck, Dr. H. Hamu, and others. These horses indicated the numerals by blows given with their forefeet. They could add and multiply and give the correct square and cube roots of numbers of six figures, and it is said that precautions were taken to exclude telepathy from the questioner as being an agent in the phenomenon. Altogether five horses appear to have been trained to give these results, and they were examined and tested by many scientists. If we can rely upon these reports the psychic brain of the horse may be further developed in this direction than that of a normal human being. (Holms, p. 242).

We shall have occasion to give further illustrations of the operation of the exchange in subsequent chapters. Broadly speaking, we may say that, in order to reach consciousness, we conceive that all sensory impressions must be transmitted to the exchange by means of etheric waves on their way to consciousness, and that from the mnema come the associated ideas which give these sensory impressions a meaning in consciousness.

SUMMARY

We set out to enquire into the fact that sensory impressions arriving at widely separated areas of the cortex are passed to consciousness in a unitary form without any

material converging brain paths. Etheric waves appear to offer a solution of the problem.

According to our hypothesis the nerve endings in the cortex set up etheric vibrations which are transmitted through the ether to the psychic brain and passed on to consciousness in a unified form.

To fulfil the functions which McDougall assigns to " psychic structure " the psychic organ must consist of two departments.

The one is the retentive department which we call the *mnema* in which all psychic dispositions are recorded and from which their resultants emerge from time to time.

The other is the active department which we call the *exchange* to which sensory impressions are communicated and from which they are passed on to consciousness together with mnemic impressions.

We also regard the exchange as operating in the reverse direction analytically to resolve motor ideas into their muscular units.

Every impulse either way between the material brain and consciousness is regarded as transmitted between the material brain and the exchange by etheric vibrations.

The psychic brain may also be provided with other mechanisms, such, for instance, as are required for extraordinary arithmetical powers, but any speculation as to the nature of such mechanism is beyond our scope.

CHAPTER IV

THE AVENUES TO CONSCIOUSNESS

We have already explained that in our view there is only one avenue between the material brain and the psychic region, namely through the ether *viâ* the exchange.

A matter of equal consequence is that there are *two* avenues to consciousness, namely from the mnema and the exchange, or two sources from which consciousness is fed. This is indicated in the diagram where B stands for the material brain, E for the exchange, M for the mnema and C for consciousness. The joining lines indicate the passage of impulses or ideas either way. These we shall consider later. For the moment we are concerned with the two channels to C from M and E respectively. The experience of the moment passes from E to C. The experience of the past from M to C or from M through E to C. The recognition of the fact that consciousness is simultaneously fed through the line E—C with present happenings, and from M with relevant past experiences is a matter of great importance.

There is of course nothing new in this except in the method of presentment in terms of our hypothesis. For

instance it was clearly recognized by Jung (*Psychological Types*). Thus he says (p. 428) :

" Thinking in general is fed from two sources, firstly from subjective and, in the last resort, unconscious roots, and secondly from objective data transmitted through sense perceptions. Extraverted thinking is conditioned in a larger measure by these latter factors than by the former. Judgment always supposes a criterion ; for the extraverted judgment the valid and determining criterion is the standard taken from objective conditions."

And again Jung observes (p. 427) :

" On no account should we imagine that the unconscious lies permanently buried under so many overlying strata that it can only be uncovered, so to speak, by a laborious process of excavation. On the contrary there is a constant influx of the unconscious into the conscious psychological process."

In our phraseology, the mnema, which is the storehouse of the unconscious, is always tending to overflow into consciousness owing to the pull exerted by ideas coming into consciousness which draw by association relevant ideas from the mnema. The normal working of objective sensorial data is to draw out such subjective data. As for instance when we see a fluttering leaf, and momentarily picture it as a bird, or when we see any object imperfectly and supplement the imperfect observation from a relevant image in the mnema.

Jung further observes (p. 474) :

" We must not forget that all perception and cognition is not purely objective ; it is also subjectively conditioned."

"Two persons, for example, see the same object, but they never see it in such a way as to receive two identically similar images of it. Quite apart from the differences in the personal equation and mere organic acuteness, there often exists a radical difference, both in kind and degree, in the psychic assimilation of the perceived image."

Jung applies these considerations to the differentiation of his two psychological types of introverts and extraverts, and as regards the extravert he observes (p. 473):

"Through an over-valuation of the objective powers of cognition we repress the importance of the subjective factor."

And he says (p. 473):

"As the subjective factor I understand that psychological action or reaction which, when merged into the effect of the object, makes a new psychic fact."

In our view this is simply expressed by saying that there are two avenues to consciousness, that for objective data through the exchange, and that for subjective data from the mnema. These two classes of materials are blended in consciousness, and the poverty or richness of the mnemic materials and the relative valuation which the individual makes of the respective materials determines the type to which he belongs.

Where there is the selective action which Jung contemplates we may regard the subjective and objective materials as following the coures M—C and E—C and being presented side by side in consciousness. But in the case, for instance, of a fluttering leaf taken as a bird, we may possibly regard the subjective impression as taking the course M—E and

then both objective and subjective impressions would be blended and pass together by E to C. Whether in this case the materials are blended first in the exchange or in consciousness seems to make no difference.

We may recognize this double avenue to consciousness in a different case, viz., when consciousness is busy with materials which are to form the basis of action through the exchange. Thus in reciting aloud a verse which we "know by heart" we can recognize in consciousness both the words we are uttering and the words which we are about to utter. Then

1. The recollection of the words passes from M to C,
2. The impulse to the exchange for the recitation of the words passes from C to E,
3. The sensory impression produced by the recitation of the words passes back from E to C.

The co-existence of the two streams from M to C and from E to C can be recognized by introspection. We have of course the consciousness of the actual words we are uttering which is simultaneous with their utterance. But we are also conscious of the words we are going to utter, which come up from the wells of memory and appear in consciousness before they are uttered, simultaneously with the consciousness of the other words which are actually being uttered. We may indicate the words being uttered by ordinary type whilst the words simultaneously coming up into consciousness ready for utterance are placed below in italic type. Thus :

1. To be or not to be that is the question
   that is the question, whether 'tis nobler

2. Whether 'tis nobler in the mind to suffer
in the mind to suffer, the slings and arrows
3. The slings and arrows of outrageous fortune
of outrageous fortune, or to take arms
4. Or to take arms against a sea of troubles
against a sea of troubles, and by opposing

The lines marked 1, 2, 3 and 4 are the spoken words. The words immediately below in the alternate lines are the words coming simultaneously into consciousness preparatory to being uttered. Thus whilst uttering the words " that is the question " in line 1, the words " whether 'tis nobler " can be simultaneously heard in consciousness. There is a gap of a fraction of a second between the fore-consciousness of the words to be uttered and the consciousness of the words when they are uttered.

Both these simultaneous streams can be recognized by careful introspection. It is something like talking to an echo, when the words of the echo mingle, but not simultaneously, with the voice sounds. Only in the case of repetition aloud the words uttered out loud are, as it were, the echo of the preceding thoughts. To get the effect it is necessary to actually recite aloud some known passage. The memory of the words with their meaning we place in the mnema for reasons to be stated later. They precede in consciousness the sensorial impression which comes from the voice and movements of lips, tongue, etc., of which we are objectively conscious simultaneously with their utterance. The thought words and the spoken words both appear in consciousness with a hysteresis between the two sets.

A kindred phenomenon will be recognized in reading aloud, when we are conscious of the words we are uttering simultaneously with the consciousness of the next line of print and its meaning.

To anyone accustomed to public speaking (the words to be used not having been thought out beforehand) the time interval between the mental conception of the words to be spoken and their utterance is still greater. Whilst uttering the first part of a sentence the way in which the latter part is to be rounded off is being thought out and formulated in consciousness. Indeed, often, whilst uttering one sentence which has been completely framed a second or more previously, the subsequent sentence is being framed and put into appropriate words, and the message handed on for vocalization to the exchange. The message is delayed in execution until the vocalization of the unfinished preceding sentence is completed and we have, if we carefully look for it, a clear consciousness of each component of consciousness.

According to our hypothesis the consciousness of the words being actually uttered comes from the material brain through the exchange.

Still more complicated is the operation when considerations have to be weighed, associated ideas to be sorted out, appropriate metaphors selected and a unitary psychic resultant formulated to be passed on through the exchange for clear utterance, whilst other words previously formulated are simultaneously on the lips of the speaker. For this simultaneous thinking of one thing and saying a different thing we require the simultaneous co-operation of con-

sciousness with the mnema and of consciousness with the exchange. We shall see later that we must recognize the double avenue *from* consciousness as well as *to* consciousness, as for instance when a motor-idea in C impinges upon both E and M. We may regard mnemic records as being set up, either by ideas in consciousness through the path C to M, or by sensory impressions through the path E to M.

SUMMARY

We regard the mnema and the exchange as being both open to consciousness and the diagram indicates the double path to consciousness from M and E, whilst all sensory impressions pass from the material brain through E.

Objective materials pass from E to C and subjective or mnemic materials are supplied by M.

Also mnemic records may be set up either by the path C M or the path E M.

Further, motor ideas in C pass to E together with relevant mnemic materials passing from M to E, and from E to B to be implemented.

In each side of the triangle an impulse may pass in either direction.

CHAPTER V

THE MNEMA

THE mnema we define as the retentive portion of the psychic brain. Of the mode in which it stores or records memories, ideas and images we know nothing, but we may refer to such mnemic records, whether of isolated events and ideas, or of groups of events and ideas, as psychograms.

Ideas in the mnema are connected by associative links and are drawn from the mnema into consciousness by associative links or tags. Let us take the simple and familiar case of a string of words which we write down as they come into the mind, each by some association, fanciful or otherwise, suggesting the next. If as each word is written the connection with the previous word is clearly noted in the mind, the whole string is memorized. No theory of " memory cells " in the brain gives a satisfactory account of this phenomenon. The memorial registration belongs to the psychic realm and the associative links are psychic. As an illustration take the following string: Ocean, weed, flower, bread, staff, officer, police, strike, blow, wind, spirit, drunkard. The phenomenon is familiar to most schoolboys.

This is, of course, a simple case. But the same phenomenon is familiar on a larger scale. We have psychograms of ideas and of constellations of ideas. Smaller psycho-

grams may form integral parts of larger psychograms which are linked together by associations and may also be linked across to central ideas, as the earth is associated by gravity with the moon, the sun, the planets and even distant stars. We cannot form any idea of the intimate mechanism of such linkages, which we must accept as a fundamental fact in the constitution of the mind. It is upon these mnemic records that the consciousness of the continuity of the life of the individual depends.

McDougall takes the view that memory partly depends upon neural structure but that " we cannot regard it as the sole or principal condition of the higher form of retention or true memory. This we see depends upon meaning ; and meaning, as we have seen, is just that all-important factor in mental process to which we can assign no immediate physical correlate among the brain processes." (p. 342).

In his view (p. 343) :—

" In so far as each sensory complex has evoked meaning in the past, it tends to revive it upon its reproduction and thus to reinstate the idea in consciousness. This is the process of the evocation of an idea from the neural side. It plays only a subordinate part in the higher processes of remembering. These are determined mainly from the psychical side. What then is it that persists in the psychical realm ? Shall we say it is the meanings themselves ? Clearly they do not persist as facts of consciousness. But the development of the mind from infancy onwards consists largely in the development of capacities for ideas or thoughts of richer, fuller, more abstract and more general

meanings. If then meanings have no immediate physical correlates or counterparts in the brain, and if the meanings themselves do not persist, we must suppose that the persistent conditions of meanings are psychical dispositions. We must believe then that there persist psychical dispositions, each of which is an enduring feature of the psychical structure and an enduring condition of the possibility of the return to consciousness of the corresponding meaning."

Although our theory of memory differs somewhat from that outlined above, it appears to us that McDougall's view is in conformity with our conception of the psychic brain. " There persist psychical dispositions each of which is an enduring feature of the psychical structure." This " psychical structure " is that which we called the mnema, and the persistent " psychical dispositions " are in our view impressed on the mnema, and it is convenient to refer to them as psychograms. Meanings in the true sense as distinguished from " mechanical meanings " can only be evoked in consciousness. But in our view ideas and groups of associated ideas can be recorded in the mnema and when recalled to consciousness, either by sensation or by associated ideas present in consciousness, will evoke the meaning which was attached to them when originally impressed upon the mnema. As explained in a later chapter, in our view every idea has its counterpart in a chord of etheric waves or vibrations, and we can conceive of these making a psychic record or psychogram in the mnema.

We must regard ideas as not only being stored in the

mnema, ready to be drawn out by sensory or ideal associations, but also as being *moulded* in the mnema. The psychic brain must have not only the capacity for integrating simultaneous sensations and ideas, but also the power of integrating a succession of impressions. For instance, our first view of an object gives us only a flat picture of it. A penny seen for the first time would probably appear as an oval, on the second view perhaps as a circle, again as a different oval. To realize that it is a disc we must have an edgewise view. We get a series of mnemic traces which ultimately give us the complete psychogram corresponding to the idea of a penny. When this mnemic image has been formed, in whatever position we may subsequently see the penny the sensory impression is associated with the psychogram, and with the idea, and is passed on to consciousness as the completed idea. A generic idea is built up in the same way. For instance, you see many dogs, from a St. Bernard to a toy spaniel. To recognize all these as dogs is a matter of education and experience. Finally a psychogram of generalized type is built up connected with the idea dog and stored in the mnema. The moulding or building up of a more definite image and idea may be illustrated by taking the case of your new dog Sambo. At the first view you get a flat picture of (say) the dog lying down. Successive views give you a number of flat pictures. You see Sambo running, jumping, standing, rolling over, barking, showing his teeth, wagging his tail, etc., etc. We cannot suppose that all these separate pictures are stored in separate " memory cells " in the material brain, nor is it likely that combined *material* traces in the brain would

give anything but a blur. But we credit the exchange operating in conjunction with the mnema with the power of integrating or combining these successive pictures into an image which is no longer a flat picture. If you are capable of visualization you will at length be able in consciousness to see or "imagine" Sambo in any familiar attitude.

In the process of building up a mnemic image of Sambo the successive pictures are drawn together by association with the idea of Sambo, and the final image remains associated with the idea of Sambo. In building up the generic image of "dog" the successive pictures and ideas of different dogs are finally generalized together with the generic idea of dog.

We may regard each of these successive pictures as an "engram" or impression of a fugitive or plastic character, the final psychogram being compounded of all these. The situation in consciousness which gives rise to a psychogram or mnemic record, is associated with a true meaning. When the mnemic record again emerges into consciousness from the mnema it reproduces in consciousness the original situation and evokes the meaning.

There are two kinds of "meanings" which it is important to distinguish. In its full sense the word "meaning" connotes the interpretation in consciousness of a complex of sensations together with ideas drawn from the mnema. If we look at a printed sentence, there are drawn from the mnema the relevant ideas which give meaning to the printed words. We often speak of the meaning of a sentence—even though it may be written in a language which

we do not understand. The sentence itself carries a meaning in the restricted sense, which is inherent in the words before they are apprehended in consciousness. So a musical score has an inherent musical meaning, though the sight of the score does not to most persons carry any meaning at all. To such " meanings " we may refer as mechanical meanings. The record of a gramophone has such a mechanical meaning. The mnemic record or psychogram has such a mechanical meaning, but the true meaning is only evoked in consciousness when the psychogram reproduces the situation which it records in conjunction with the associated idea.

It seems clear, however, that the psychogram may in some cases function mechanically in regard to a stimulus—as in the case of the amœba, if we regard the amœba as having no trace of consciousness. And in the case of writing, where no voluntary attention is given to the act of writing, the mnemic record upon which the ideo-motor action depends appears to function mechanically. But if in consciousness the psychogram evokes a true meaning, the mechanical stimulus arising therefrom may be modified by voluntary attention, so that the reaction is no longer mechanical.

Let us take the example of writing which will be useful to us when we come to consider the nature of ideo-motor activity.

In learning to write the child first learns to form his separate letters. He writes in his copy-book a row of a's, b's, etc., until with the help of his teacher he knows the shape and the name of each letter. So by repetition there

is formed in the mnema a psychogram of each letter which is associated with its name. The next step will be to form images of combinations of letters connected with the sound of each combination. He will learn the sound of combinations such as *ab*, *ob*, *do*, *go*, etc., and will get associated mnemic images of the form and the sound. How far this process will go will depend on the person, his age, and education. He may recognize such words as Constantinople or parallelopiped at a glance. But the essential thing is that he will acquire mnemic images of separate letters associated with their names, of syllables with the sounds, and of words with ideas, ready to be drawn from the mnema for the purposes of clothing ideas with the associated words, and writing the words as sequences of letters. Furthermore, together with shapes and sounds there will in our view be recorded in the mnema psychograms of the synaptic sequences which are brought into play in speaking or writing the letters and words, but we must reserve this subject for the next chapter, where the relation of the mnema to motor habits is further considered. Habits of thought may also be engrained in the mnema as determinants or otherwise.

The function of the mnema in amplifying the meaning of sensations, is of great importance. Sensations, whether auditory or visual are often too imperfect to furnish forth their meaning, but they may in consciousness give enough to draw from the mnema the complete image or idea. Thus a sketch or a caricature of a known face consisting of less than a dozen strokes may be enough to present in consciousness the completed image.

Water itself is invisible, but we learn to recognize it visually by its effects in the reflection and refraction of light. A few striking reflections, whether in nature or in a picture, convey to us at once by mnemic associations the complete idea of water.

To a person born blind the mnemic psychogram of an object is associated with tactile sensations. Thus he will recognize a cat by feeling it, and if he gains his sight by an operation he will not recognize the cat by looking at it. If he feels it and looks at it simultaneously a new psychogram is set up by which the visual picture of the cat is linked with the idea and with the former psychogram.

When a song is sung with imperfect enunciation, we may find that if the words are new to us we can make nothing of them, but if the words are more or less familiar we can follow it notwithstanding. Here we recognize the two sources of the material which comes into consciousness. In one case there is a sensorial impression, which we strive to catch clearly, but without success. In the other case there is added to the imperfect sensorial impression the mnemic trace. The combination of the two may enable us to follow the whole song clearly, though the sensory impression alone is useless, and the memory alone quite insufficient to enable us to recite the words.

In vision the function of the mnema is of great importance, especially with distant objects of which one only gets a flat picture. In the distance a house and a hay-rick may be indistinguishable. It is the mnemic record of known objects combining with the imperfect visual impression which gives us the meaning in consciousness. A chimney

at one end of the object suggests a house and the mnema fills out the picture. On the other hand " appearances are often deceptive," and if the hay-rick has a projection at the top which may be mistaken for a chimney, the mnema will help to register it in consciousness as a house, and may even supply doors and windows. The impressionist style of painting often depends on the clever placing of shapeless dabs of colour in such a way as to give a suggestion of objects which will draw out the completed idea from the mnema.

Of course, the mnema is not merely concerned with the record of images and ideas due to sensations, but also with the record of ideas of an abstract character. Take, for instance, the elaboration of a theory of the ionization of a salt solution. Various converging phenomena give the germ of such a theory which is recorded in a plastic state in the mnema. Further experimental facts lead to its modification in this or that direction. The plastic nature of the mnemic record allows of the modification and gradual elaboration of the germinal idea, and a more or less complete theory is gradually built up and recorded.

Suppose it were true that the brain is competent to retain a memory of sensorial impressions. How can we suppose it capable of the retention of purely ideal memories which have no definite or appreciable sensory associations. You may create for yourself a philosophy which is purely ideal but which is clearly retained and which you can recall from time to time. For the retention of ideal memories with no sensorial associations, the postulation of the psychic brain resolves the difficulty.

It will be seen that complex or related ideas are recorded in the mnema in constellations or groups. The law of association brings each added idea to its kindred group. We are not able to rationalize the mechanism of the association law, but it must be accepted as a fact. These groups may be large or small. Thus when the hypnotist suggests to a subject that he is Napoleon, all the ideas that he has previously acquired as to Napoleon are at once at his command as a complete group. So far as his knowledge goes he will act the part of Napoleon. The ideas associated with the word Napoleon are extracted from the mnema as a group. Change the supposed character and another group of ideas is at his service for the part which is suggested to him.

Furthermore, a series of incidents occurring during one hypnosis and subsequently forgotten in the normal state may be revived and remembered as a complete group during subsequent hypnosis.

The grouping of related psychograms is illustrated by the readiness with which we can switch off from one occupation to another, or from one subject to a totally different subject. The barrister who opens a case in one court, and is immediately called off to cross-examine a witness in another court on a wholly different and often very complicated set of facts, depends for this power on the grouping which takes effect in the mnema. So also does the phenomenal chess-player who can keep separate the threads of a dozen different simultaneous games, and passes from one to another without apparent effort.

The grouping of ideas may extend to the incidents of

half a life-time, all strung upon the association string of continuous existence. Cases of accidents which cause complete amnesia as to events before the accident illustrate this. Henceforth a new life is lived and a new record of experience is formed, which may constitute a new group. Some occurrence may result in the suppression of this group and the group constituting the life previous to the accident comes again into play as a whole, and in some cases the two groups are known to have alternated. What may be the cause of such alternation is too obscure to be discussed here. But the rôle of suggestion may be a leading factor as in hypnosis.

Suggestion may in one sense be said to be responsible for all records in the mnema. We may look upon a visual impression as a suggestion which is augmented and intensified by subsequent visual suggestions. But the term suggestion is not usually used in this sense, though it should always be borne in mind as one of the most potent factors in the formation of the determinants which may be lodged in the mnema.

An inhibitory suggestion may impress a psychogram in the mnema which will be effective to block the passage to consciousness of ideas or sensations which it is desired to inhibit by the suggestion. We shall deal with this aspect in subsequent chapters. It may also be remarked that a constellation of ideas or complex which has formed a psychogram in the mnema may act as an inhibitive determinant in a similar way.

In this matter of determinants of thought and action the mnema plays the leading rôle. Determinants may be

lodged in the mnema by education, by environment, by auto-suggestion, etc., all of which are really forms of suggestion. When a matter is being considered in consciousness, any relevant determinants emerge from the mnema and take a part, sometimes the chief part, in determining a decision.

Determinants may be voluntarily or negligently acquired and stored up, and may help or hinder the operation of the mind. Though the operation of the mnema in presenting relevant materials in consciousness may be automatic, that automatism is largely determined by determinants which are the product of our own previous volition.

When speaking or writing on a subject to which voluntary attention is being given, the mnema discharges important functions. It not only furnishes us with the words to clothe our ideas and regulates ideo-motor action for their expression, but it furnishes us with relevant ideas which are stored there to be presented in consciousness in conjunction with the primary ideas. It also furnishes us with similes and metaphors. In fact in extempore public speaking the difficulty is to make a rapid selection from the relevant ideas and metaphors which crowd upon us from the mnema.

We have to regard the phenomenon of association which governs memory sequences and groups as an ultimate fact in the constitution of the mind and its mechanism. That there is a tendency for associated ideas to come into consciousness in a crowd is also a fact, and Professor Driesch (*The Crisis in Psychology*, p. 61) regards this as being kept

in check and controlled by a "determining tendency." Any idea may have fifty linkages attached to it, and if they came out pell-mell from the mnema confusion would be the result. The "determining tendency" depends upon the end which is held in view. This tends to limit the number of associative possibilities and to select out of the number left by its limiting power such associations as are suitable for the solution. These agents have been called *latent directing potencies* since in the mnema they appear to be unconscious in their action.

Possibly we may say that this automatic selective agency depends on a two-fold linkage—first the link of the primary idea with the mnemic idea, and secondly, the link between the idea of the end in view and the mnemic idea. This twofold linkage results both in limitation and selection. We must also remember that voluntary attention makes the final selection.

The mnema may be regarded as automatic in its action in presenting in consciousness materials relevant to the subject with which consciousness is occupied. One after another ideas and constellations of ideas are presented under the traction of successive linkages—drawn out from the mnema, and presented singly or in groups to be dealt with in the field of consciousness, where the sequence of ideas is no longer automatic but subject to the results of voluntary attention. We have pointed out that we are justified in regarding the mnema as not only supplying ideas through the exchange but also direct to consciousness, so that there is a double path to consciousness—from the mnema and also from the exchange.

Character we must regard as inherent partly in the ego, partly in the psychic brain. To the ego belong the characteristics of love or hate, selfishness or altruism, hope, fear, courage, magnanimity, etc. To the psychic brain belong those elements of character which arise from determinants and psychic habits engrained in the mnema.

The ideal or the ruling principle which largely determines character must be assigned to the ego, but the determinants which make for or against the pursuit of this ideal are lodged in the mnema. These determinants are created by the voluntary acts of the ego and the way in which mental conflicts are from time to time resolved. The formation of such determinants as the result of voluntary efforts in various directions is a thing which goes on from day to day.

The mnema appears therefore as the storehouse of past experiences and psychograms of every kind, ready to furnish ideas to consciousness by associative linkages with ideas there, or to be drawn into the exchange by association with sensorial impressions there and in combination with them passed on to consciousness. And, as we shall see in the next chapter, psychograms or synaptic sequences for ideo-motor action may be furnished forth by the mnema to the exchange by the impact there of the associated motor idea in consciousness. The associative linkages or " tags " as we may call them, may come either from consciousness or from the exchange, or from ideas in the nascent phase (as to which see Chapter IX).

SUMMARY

Memories and experiences are recorded in the mnema and are extracted therefrom by associative linkages or tags. Such records we call psychograms. Psychograms may cover single ideas or constellations of ideas.

Ideas are not only stored but moulded in the mnema. A succession of pictures of an object produces a final psychogram which is the resultant of them all.

We may say that the psychogram has a mechanical meaning (like the record of a gramophone), which becomes a true meaning when the psychogram reproduces in consciousness the materials from which it arose.

One important function of the mnema is to amplify sensations. Thus visual sensations are usually imperfect but they furnish the associative tags which draw from the mnema into consciousness the complete realization of the object.

Ideas may be associated in the mnema in groups. The mind may be voluntarily switched off from one group to a totally different group.

In hypnosis, the suggestion that the subject is Napoleon, brings the Napoleonic group into prominence. In cases of accidental amnesia, a new group may be built up to be sometimes afterwards replaced by the old group.

Complexes and other determinants are lodged in the mnema. Inhibitory determinants may block the passage to consciousness of either sensations or ideas.

In speaking or writing the mnema furnishes us with

words to clothe our ideas and also with relevant ideas, similes and metaphors.

Ideas may have many linkages which would tend to draw out from the mnema a crowd of relevant ideas.

There is said to be a "determining tendency" which limits this outrush. Probably there is a double linkage which results in limitation and selection.

Character is partly inherent in the ego and partly in the mnemic determinants which are being constantly built up.

CHAPTER VI

IDEO-MOTOR ACTION

The absence of any mechanism in the material brain adapted to synthesize a complex of sensations and to convert it into an idea or meaning led us to the conception of a psychic organ which should be capable of effecting the synthesis. Furthermore, the necessity for postulating some " psychic structure " which could retain and revive memories of the psychic result of experiences was in conformity with the conception. We were led to the hypothesis that whilst the material brain dealt with sensations the psychic brain dealt with ideas. We have to consider farther how the hypothesis of the psychic brain may help us to rationalize the phenomenon of the conversion of motor-ideas into movements. If the psychic brain is the field for ideas it seems to follow that the implementing of motor-ideas should begin at the psychic brain.

A motor-idea may involve for its execution the co-ordinated action of a large number of muscles—of eyes, neck, limbs, etc. Take for instance the case of the man to whom a pistol is pointed with the cry of " Hands up " and whose response is to jump behind a tree. Whether the nature of the response is the result of quick consideration in consciousness, or whether it is the result of past experience, is not the matter we are now considering. The

response requires the simultaneous excitation of many muscles, to each of which an impulse must flow along an appropriate path. The man has no consciousness of the particular muscles to be brought into action. Yet somehow the separate impulses are given. It is clear that there must be some mechanism which splits up the motor-idea into its nervous and muscular elements. Things go on as if the mind " sub-consciously " *knew* what were the muscles to be activated.

Broadly speaking, our hypothesis is that the exchange department of the psychic brain serves not only the synthetic purpose of developing ideas out of sensations, but also the analytic purpose of splitting up and transforming a complex motor-idea and guiding the multitude of nervous impulses which may be required to implement it.

To develop the hypothesis we must begin with a slight sketch of the nature of the nervous system. It is a vast congeries of what are called " reflex arcs." One of the most familiar reflexes is the " scratch reflex " of a dog. If a dog be lying asleep on its side and its flank be tickled, the hind leg will be automatically jerked forward so as to scratch the spot which is irritated. The mechanism of such a reflex arc in its simplest form, comprises a conductor of nervous impulses which consists of three sections. At the peripheral end we find the " receptor " which may be a nerve end in the skin, which receives the stimulus and starts the nervous impulse. At the other end we find the nerve ending in a muscle constituting an " effector " which contracts under the nervous impulse and produces a movement. In between these two ends there are two gaps in

the conductor. At each of these gaps the ends of the conductor terminate in neurons (or nerve cells) which send out fine tendrils into the grey matter which fills the gaps. These gaps are called synapses. They introduce resistances into the path of the nervous impulse. Such a system is the simplest form of " reflex arc," but in fact the distribution of impulses is much more complex.

At the synapse nearest to the receptor the nerve fibre branches into a number of fibres through a corresponding number of synapses which may thus carry the impulse from the receptor in all directions to a number of effector muscles. At the last synapse next to each effector, a large number of paths from various receptors converge on the effector, each governed by its own synapse. These converging paths may carry impulses from a multitude of receptors to the end path by which they may reach the effector. Thus from each receptor starts its own " private path " which branches into many paths going in various directions, whilst each effector is approached by a " final common path " which receives branches from many receptors. We thus see that the nervous impulse from one receptor may " irradiate " to a large number of muscle fibres. So also each muscle fibre may be open to the impulses from a large number of receptors. Hence but for the resistance of the synapses a single pin-prick at any point of the skin might send nervous impulses all over the body, and in fact with strychnine poisoning, which appears to cause a general break-down of synaptic resistance, convulsive movements may be produced in all directions by the excitation of a single receptor. It is the resistance of

the synapses which prevents such a confused effect, and it is by the reduction of the resistances of the appropriate synapses that a nervous impulse is guided through the required paths to give the necessary co-ordinated movements for any particular reflex action. By the variation of the synaptic resistances the end effect of a particular excitation may be confined to some small muscular field or may be distributed to a wide field including musculature of limbs, eyes, neck, etc. And furthermore, the effect of a number of excitations from the receptors of eyes, ears, feet, etc., may by the variation of synaptic resistances be distributed to the required muscular field or fields.

We must also refer to the inhibition of impulses which is required where the movements of antagonistic muscles, such as a flexor and extensor, have to be co-ordinated. If the extensor is to be stimulated the flexor must be relaxed and *vice versa*. Various theories have been propounded to explain how the conductivity imparted to one synapse may drain away, as it were, the impulse which might otherwise flow through an antagonistic synapse. No satisfactory theory has been formulated, but the requisite conditions would appear to be satisfied if we may suppose that every synapse is resistant until the appropriate excitations for the required reflex reduce its resistance so as to open the required path for the impulse, leaving other paths blocked. It seems clear that all synapses involve some definite resistance, since it is observed that excitation below a certain minimum or threshold value will not force its way through a synapse, though a repetition of such

impulses, each below threshold value, may succeed in forcing a path.

It thus comes to pass that an excitation at one spot might travel to any part of the body but for the synaptic resistances. Professor Sherrington (*Integrating action of the nervous system*, p. 154) observes:

"Evidently the irradiation from each entrant path tends to run in some directions and not in all. . . . The different resistance (of different paths) seems more probably referable to differences in the facility of conduction of different synapses. . . . There is abundant evidence that different synapses differ from one another" in the height of the threshold resistances which will permit the passage of an impulse.

Professor Stewart observes (*Manual of Physiology*, p. 871):

"It is a question of great interest how the isolated conduction of the impulses in a given reflex arc, in so far as it depends upon the physiological condition of the are and its connections, is normally achieved. The best answer which can at present be given is that it is not equally easy for a reflex excitation to pass across all the synapses which are potentially open to it, and that a lowering of the resistances of the synapses in the favoured path is probably quite as important a factor in the isolation, as an increase of resistance in those which are to be barred. Following the path of least resistance, the excitation traverses the synapse or synapses which it is easiest for it to break through. What property of the synapse is associated with resistance to the passage of the impulse is unknown."

We thus get a view of the nervous system as a vast network; the peripheral receptors of which are played upon by various kinds of excitation, which might ramify through all the system but for the interposition at every branching point of the synapses which serve to block the impulses except in the paths required to be open for the passage of the impulse. The above sketch is intended to develop the fact that it is by the variation of the resistance of the synapses that nervous impulses are directed along their appropriate paths. In pure reflexes this direction is automatic and does not depend upon the consciousness or will of the individual. How then is this system of reflex arcs made use of by the individual to carry out voluntary actions?

It should be observed that many of the reflex arcs cannot be affected by conscious volition. As to these therefore we have not to consider the effect of a volitional psychic impact. We may possibly regard them as being physiologically operated without any psychic factor. As regards reflex arcs which normally act automatically and without any concomitant in consciousness, but which can on occasion be volitionally affected, it may be observed that it is quite possible that a separate path from the normal physiological path may be open to voluntary action. We shall not need to give this class separate consideration. What we have to consider is how a motor-idea formulated in consciousness may liberate nervous impulses guided in the correct paths to implement the motor-idea.

The hereditary paths in which the resistance is automatically lowered by the appropriate stimulus are com-

paratively few. The multiplicity of paths which may be opened by voluntary effort may be regarded as initially of high resistance. The continual repetition of efforts of the same kind, as in learning to walk by the human infant, gradually increases the facility and certainty with which the resistance of certain paths is lowered and new and stable reflexes may thus be established. The point to be considered is, How the reflex arcs are made subservient to voluntary effort, and brought under control for this purpose.

As to hereditary reflexes Sherrington observes (p. 388):

"Perfected during the course of ages they have during that course attained a stability, a certainty, and an ease of performance beside which the stability and facility of the most ingrained habit acquired during an individual life is presumably small. But theirs is of itself a machine-like fatality. . . . To these ancient invariable reflexes, consciousness, in the ordinary sense of the term, is not adjunct. The subject as active agent does not direct them and cannot introspect them.

"Yet it is clear, in higher animals especially so, that reflexes are under control. Their intrinsic fatality lies under control by higher centres. . . . In other words the reactions of reflex arcs are controllable by mechanisms to whose activity consciousness is adjunct. By these higher centres, this or that reflex can be checked or released or modified in its reaction with such variety and seeming independence of external stimuli that the existence of a spontaneous internal process expressed as 'will' is the naïve inference drawn. Its spring of action is not now our question; its seat in the nervous system seems to corre-

spond with that of processes of perceptual level. It is urgently necessary for physiology to know *how* this control —volitional control—is *operative* upon reflexes, that is, how it intrudes and makes its influence felt upon the running of the reflex machinery ? "

Whether we shall ever *know* this may be doubted. All we can do is to frame a hypothesis which may be found to be more or less in conformity with facts. What seems clear as a starting point is that voluntary control must involve the variation of the relative resistances of the synapses. It is not known what is the intimate synaptic mechanism by which resistance is varied, but the whole problem hinges upon some selective action upon the multitude of synapses. If we assume that all the synapses which can be controlled by volition are of sufficiently high resistance, the problem is simplified, since inhibition is the normal condition, and the lowering of the resistances of the proper synapses will be sufficient to open the proper paths. Our final hypothesis will be that for voluntary movements the resistance of the synapses is reduced by the selective action of etheric waves from the exchange, but we may consider two or three cases of physical synapses which might be made the basis of alternative hypotheses.

If we have a current of electricity passing through a network of conductors, every part of this network will take part in the conduction, except that if the potentials at each end of an element were the same, that element would carry no current.

Now such a network differs from a nervous network in an important particular. A nervous network is not continu-

ous, but the branchings are interrupted by synapses, each of which must be regarded as having a normal resistance, which blocks the impulse seeking to pass it, unless such impulse has a certain " threshold " or minimum value. In the case of an electrical network every element may get *some* current, however great its resistance. In the case of a nervous network connected by synapses the impulse instead of traversing *all* the possible paths, will only traverse those paths where the synaptic resistance is at such a low level that for it the impulse is above threshold value and we shall therefore find such an impulse traversing only one, two or three nervous segments of the body, and in each of those segments traversing only a limited number of paths.

If however at certain points in an electrical network we interpose electrolytic cells with polarizable electrodes, we at once introduce conditions which remind us of the properties of a synapse. That is to say, in an element of the network where there is a polarized electrode which opposes the passage of the current, no current will pass until it has attained a threshold value sufficient to overcome the resisting polarization. Thus if the opposing E.M.F. in a cell be one volt, then unless the potential difference between the ends of the element exceeds one volt, no current will pass through the element. One volt is the " threshold " value of the potential difference which will send a current through this physical synapse.

Another physical analogy which furnishes ideas may be given. In the process of the synthesis of ammonia from nitrogen and hydrogen one of us devised an apparatus for

the detection of small quantities of oxygen in the stream of hydrogen passing to the converter. It was important to detect these traces of oxygen because of the risk of explosion involved, at the high temperatures and pressures employed. A small by-pass from the hydrogen stream permitted some of the gas to pass over a catalyst and on through a pair of platinum gauze electrodes separated by a layer of non-conducting salt crystals. If oxygen was present it was by the agency of the catalyst combined with hydrogen to form water vapour. This water vapour passing through the layer of salt crystals was absorbed by them and therefore made them conducting. An electric current was in this way enabled to pass through the electrodes and the salt crystals. Professor Todd devised an arrangement by which through a relay this current rang a warning bell. Of course this is only an analogy, but the electrodes separated by salt crystals formed a physical synapse the high resistance of which was forced by the passage of water vapour if more than a certain small proportion of oxygen was present.

Another analogy which specially lends itself to the elucidation of our hypothesis is furnished by the coherer used originally for wireless telegraphy. If the ends of a conductor forming part of a circuit through a battery and galvanometer are separated by metallic filings, on the discharge of a leyden jar producing a spark at a distance from the coherer, its conductivity is immediately raised by the impact of the etheric waves produced by the spark, and a deflection of the galvanometer results. In this case the phenomenon is attributable to the etheric waves received

in the circuit forcing a passage through the metallic filings by a sort of molecular welding at their points of contact. The increased conductivity remains until a tap of the coherer disturbs the molecular contacts produced. Here again is a physical synapse whose resistance in this case is diminished by the impact of etheric waves. Other physical synapses suggest analogies, such for instance as the Nernst lamp, in which the filament was a non-conductor until heat was applied.

The analogy of a physical synapse whose resistance was reduced by etheric waves can without difficulty be applied to the psycho-physiological problem.

One of the chief incidents of this problem is that a motor-idea, if the will to execute it is exerted, undoubtedly liberates or initiates a nervous impulse. Another undoubted fact is that this voluntary effort results in the due distribution of the impulse to the appropriate reflex arcs. The idea can only be implemented by splitting it up, as it were, and distributing the several impulses to the reflex arcs concerned. This process does in fact take place. The only theory which physiologists have devised for this distribution of the impulse to the various muscles involved in the execution of the idea, is that the distribution of the impulse (which may be very complicated) is determined by variation of the resistances of the various synapses involved. All but the proper channels are thus blocked and the impulse follows the various paths of least resistance which result.

How then is the volitional reduction of the resistances of the synapses which would block the necessary paths

effected ? According to our hypothesis it is effected through the agency of etheric vibrations of various wave lengths impinging upon the synapses with which they are in tune. Every synapse which is capable of volitional response is according to our hypothesis capable of responding to a definite etheric note which is originated by the impact of the motor-idea upon the exchange. We may figure each synapse as comprising a " wireless " resonator capable of responding to a definite etheric note proceeding from an exchange resonator. The simplest example of a resonator is furnished by two piano strings tuned to the same note. If either is set vibrating the air waves set up cause the other to respond in unison.

The problem of psycho-physical interaction stands in quite a different position now that the etherial constitution of matter itself has been formulated. When we know that the brain itself consists of nothing but protons and electrons, themselves etherial in constitution, there is no *à priori* objection to the notion of their interaction with the immaterial " ons " of which according to our hypothesis the substance of the psychic organ is composed. Both at the psychical and physical end we have etherial " ons " (though of different kinds) immersed in the parent ether which bridges the psycho-physical gap. As to the mode of interaction our hypothesis is that the impacts of the motor-ideas in consciousness, which are caused by voluntary effort to impinge upon the psychic organ, there set up etheric vibrations, which correspond to the nature of the ideas, and that these vibrations are received by the synapses and modify their resistance. The transformation of ideas

into etheric vibrations will be further considered in the next chapter.

If according to our hypothesis the psychic brain is composed, not of protons and electrons, but of other "ons" formed out of the ether, then the conception of etheric waves as bridging the gap between the etherial "ons" of the psychic brain and the material, but still etherial, electrons and protons of the cortex seems *à priori* probable. At all events it is a hypothesis which is well worth consideration.

Thus according to our theory the exchange of the psychic brain is the medium, not only for the synthesis of sensations into ideas, but also for the analysis of motor-ideas into the requisite motor impulses. When a motor idea is present in consciousness and the will to implement it is exerted, we regard the impingement of this voluntary motor-idea upon the psychic brain as breaking it up into the requisite motor elements and generating the requisite etheric oscillations to carry the component impulses through the ether to impinge on the requisite synapses in the appropriate motor areas of the cortex. That these component motor elements *can* be sorted out and delivered to the appropriate final effectors is an undoubted phenomenon which we know occurs whenever we voluntarily make any kind of movement.

It is quite possible that any elaboration in detail of this etheric wave hypothesis may turn out to be of fugitive interest. New facts will doubtless cause modifications, but it is worth while to speculate on some details, if only as a starting point for further experiment.

We assume that every synapse which can be volitionally affected comprises a " wireless " resonator having its own definite note (i.e., rate of vibration) and capable of responding to that note only. Further that the exchange is furnished with a complete gamut of resonators which are set in vibration by the impact of motor-ideas, as if the exchange were a piano of which the resonators were the strings and the motor-ideas the fingers of the player. A motor idea is regarded as consisting of unitary elements corresponding to the synapses to be affected. Each unitary element corresponds to a definite note. On the impact of a motor idea its elements would give rise to definite notes in the exchange resonators. Every synapse which can be volitionally affected, having its own definite note, responds when the corresponding note is excited in the exchange resonator, and the receipt of this note by the synaptic resonator has the effect of reducing its resistance to the point which permits the nervous impulse to traverse it. In the case of most movements various muscle fibres will require to be moved simultaneously. Each of these may require its own separate impulse so that a number of synapses responding to different notes will require to be opened. We may speak of the notes of such a group of synapses as a synaptic chord. By the impact of the motor idea upon the resonators of the exchange each of the unitary elements of the motor idea excites its own note in the resonators, and this group of etheric notes when received by the corresponding resonators of the synapses operates them as desired and directs the compound motor impulse into the required channels. For many operations

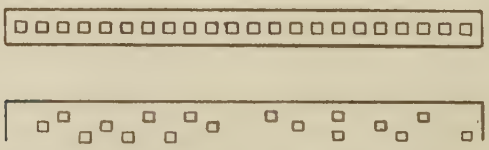
consecutive impulses are required, and consecutive operation of synapses, to which we may refer as synaptic sequences. All these synaptic notes, chords and sequences may be referred to the available gamut of etheric waves just as in the case of a musical composition all the notes, chords and sequences are referable to the eight or nine octaves of acoustic waves. In fact, in our view, if we knew the numbers of etheric vibrations corresponding to each synaptic note, we might write down the synaptic impulses for every movement or combination or sequence of movements, in precisely the same way as a musical score is written with the aid of lines and spaces corresponding to the rates of vibration of the several notes employed.

Upon this view the exchange, so far as ideo-motor action is concerned, comprises an instrument which can give out etheric notes over the whole range of octaves allotted to this purpose. A single octave of etheric waves may comprise an indefinite number of distinct notes, as is indicated by the visible light spectrum, which only covers one octave of etheric notes. The impact of a motor-idea in consciousness, which by volition is caused to impinge upon the exchange, strikes the appropriate notes or chords for operating all the synapses required to execute the motor-idea. The etheric notes when struck affect the corresponding synapses which are in tune with them and open the required paths to implement the motor-idea.

The formation of a motor habit involves the attainment by a process of trial and error of the facility of at once striking the right notes in the resonators of the exchange to produce the appropriate synaptic chord for every

motor-idea involved, and the requisite synaptic sequences. Once this facility has been obtained, by the process of trial and error, we regard the mnema as registering a psychogram of the appropriate chords and sequences in conjunction with the motor-idea and producing the mnemic record in association with the motor-idea at the will of the operator. The mnema and the exchange are so related that as the motor-idea in consciousness impinges upon the psychic brain it calls forth the associated motor psychogram which determines which notes of the exchange resonator should be sounded. On referring to the diagram in Chapter IV, the motor idea in C impinges upon both M and E and calls from M the psychogram associated with the idea which determines the notes, chords and sequences sounded by the exchange. The cortical resonators respond to these notes and open the required synapses to implement the motor-idea.

The implementation of a motor idea may be compared functionally with the operation of a barrel organ furnished with a board having a row of holes corresponding to all the notes within the range of the organ. A strip of paper pierced with holes representing notes and chords to be played is drawn over the board so that each chord in turn is sounded. The



strip functionally represents the psychogram and the board

the exchange resonators. The motor-idea calls forth the associated psychogram which determines which notes of the exchange shall be sounded.

As an illustration of ideo-motor action, let us take the writing habit. To establish the habit one has to learn how to sound the right notes and chords and the right sequences of chords to govern the synapses. In our view the mnema by repetition acquires an image of a letter together with the idea of its name and a psychogram of the requisite synaptic sequences. In the course of this acquisition the muscles have been painfully compelled to go over the outline of the letter with the pen until the facility required for writing it is attained. In this the exchange has been co-operating with the mnema and by a process of trial and error the psychogram has been formed which enables the exchange to operate the requisite synapses with facility in due sequence. According to our theory, this sequence of synapse operations *has been impressed in the mnema as a psychogram*, just as much as the shape of the letter. The shape and sound of the letter together with the psychogram of the synaptic sequences are associated together, so that when the letter is to be written the mnema not only furnishes the shape, but also the psychogram of the synaptic sequences to be implemented by the operation of the exchange.

We may add here a sequel which will be elaborated in the chapter on hypnosis. If to a hypnotic subject it is suggested that he is unable to write, say, the letter *b* and he is asked to write out a passage, he will write it with the omission of all the *b*'s. According to our view a suggestive

anti-psychogram which has been implanted in the mnema blocks the synaptic sequences for *b* coming from the mnema, so that the exchange is deprived of these mnemic sequences.

It has been said that habit consists in "the establishment of nerve paths of least resistance," but this seems to be a very inadequate account of the matter. We have hundreds of habits, each involving many nerve paths. For writing the letter *a*, perhaps twenty separate but co-ordinated muscular movements are involved, with perhaps twenty nerve paths. Is it to be assumed that the resistance of these nerve paths is permanently lowered? Then how could they be used for other movements involving some of the same muscular elements? If the nervous changes involved are permanent the nerves affected would presumably be useless for writing the letters *b*, *c*, *d*, etc., which would involve some only of the same muscular elements and in totally different sequences. So that for the writing habit hundreds of permanent paths of least resistance would be required to be established, and for all the habits of a lifetime many thousands of such permanent paths. The result would seem to be a synaptic chaos. How are these permanent paths of least resistance to be prevented from allowing nervous impulses to flow when they are not wanted?

The theory that habit depends on the establishment of permanent paths of least resistance does not appear to rest on any secure physiological basis. But that habit depends on the registration of the results of past experiences is undoubted. Habit involves the establishment in some

way of definite sequences of muscular movements. It is clear that there must be some registration of these sequences, but the notion of a permanent lowering of the resistance of thousands of synapses fails altogether to account for the facts. The human organism with its reflex arcs, synapses and muscular elements is an instrument upon which many tunes can be played, but not by permanently tampering with the strings of the instrument in order to fit particular tunes. The hypothesis of one instrument of nerves and muscles played upon through the various mnemic records, which are the results of experience and which leave the instrument intact and available for every tune, seems the most satisfactory.

The theory of habit formation by the establishment of psychograms as contrasted with the theory of the establishment of permanent paths of least resistance is confirmed by observation of what takes place in the replacement of one habit by another. We have already pointed out that a psychogram is capable of being moulded, which would permit of gradual changes in habits. Further, in the case of a new habit competing with an old habit an anti-psychogram may be set up which will be effective. Suppose one has been accustomed to look for particular articles (say stockings) in a particular drawer and for some reason the storage has been changed to another drawer. For some time, possibly weeks, one will often go to the wrong drawer, until a new psychogram has been established and the old one wiped out or displaced by the new anti-psychogram. This is a trivial instance, but the principle applies to any motor habit which is totally changed. It is difficult to

think of such changes in terms of established paths of least resistance becoming gradually more resistant and so restored for use in the general system of reflex arcs, having been in the meantime de-mobilized for general purposes.

It will be observed that the problem of ideo-motor action involves the converse of the problem of integration of sensations. In the latter case sensory impulses at widely separated points of the cortex have finally to be brought to a focus in consciousness without any physiological paths for integration, and we found that the hypothesis of etheric vibrations bridged the gap which was not physiologically bridged. For ideo-motor action we have a motor idea in consciousness consisting of unitary elements which have to be distributed from the focus of consciousness to widely separated synapses, and again the hypothesis of etheric vibrations bridges the gaps for which there are no physiological paths.

With reference to *graduated* ideo-motor action it is difficult to conceive of it on any purely physiological theory. You are going to strike a blow with your fist, and you wish to direct it a little to the right or left of a given spot, or a little higher or lower. You wish your blow to be heavy or light as the case may be—perhaps a knock-out blow, perhaps a mere tap or a feint. You wish therefore to adjust the length of your movement to within perhaps a sixteenth of an inch. Having this complex idea of the blow you wish to give—how is the idea implemented ? We suggest that the impact of the idea on the exchange not only automatically analyses the idea so as to operate the various resonators required for the synaptic sequences, but it also

quantitatively affects each resonator so as to produce the larger or smaller amount of synaptic lowering of resistance, which shall give the emphasis to each nervous impulse which is required for the graduated effect demanded. In fact this graduation is somehow effected. No purely physiological explanation of the required distribution of the idea both quantitatively and qualitatively seems possible.

Our theory will give a good account of various phenomena of reflex action. For instance, we may refer to the phenomena of conditioned reflexes. According to Bayliss (*Principles of General Physiology*, p. 503) :

" When food is taken into the mouth stimulation of the various receptors in the mucous membrane brings about reflex secretion. This is the primitive unconditioned reflex, present even without the higher parts of the brain. But it can be modified as everyone knows. The sight, or even thought of food, may excite secretion ; this is ' psychical secretion ' and it requires the highest parts of the brain. . . . Now it is just this aspect that can be made into conditioned reflexes. Any phenomenon of the outer world for which the animal in question possesses appropriate receptors, can be brought into temporary association with the salivary secretion, so that it becomes an exciter of secretion, if only it has been frequently presented at the same time with the unconditioned reflex stimulus, food in the mouth."

It appears to us that the formation of such a conditioned reflex follows much the same lines as the formation of a psychogram by hypnotic suggestion, which will be con-

sidered in Chapter XIII. Let us take a simple case where we can examine our own sensations. To a person who has no experience of a lemon the sight of a lemon or of a person eating one would not produce salivation. But when a lemon is eaten for the first time, the simultaneous acid taste and salivation become associated with the idea of a lemon. There is a psychic effect, which is the same as if a hypnotic suggestion were made—" When you see a lemon your mouth will begin to water." Such a suggestion, as explained later in the chapter on " Hypnosis," is regarded as creating a psychogram which operates as a determinant when the associated tag occurs. The first experience of a lemon and its acid taste and salivating effect operate as a suggestion would upon a hypnotic subject. They impress a psychogram in the mnema so that in future the sight of a lemon will be the tag which will cause the associated psychogram to operate as a determinant and induce salivation.

Bayliss illustrates the matter by the case of a dog, which is a little more complex than that of the lemon. He observes (p. 503) :

" A dog when given food secretes saliva, as is well-known. Suppose that every time the food is given a particular bell is rung. After a number of repetitions of the combination of bell and food, the sound of the bell alone is found to cause secretion of saliva. A conditioned reflex to the sound of the bell has been formed."

Upon our hypothesis there is given by repetition a forcible suggestion that the sound of bell means food, and the idea of food causes salivation. The mechanism of this

is, in our view, the creation of an appropriate psychogram. This probably takes place in two stages. The eating of food produces salivation by the unconditioned reflex. The first stage is that the mere sight of food subsequently induces salivation. This is a psychic effect, since the idea of food now produces the same effect as the food itself. The sight of food now acts suggestively and the effect is in our view produced by the mechanism of a psychogram connecting the idea of food with salivation. The next stage is the suggestion by repetition that the sound of the bell means food, and this suggestion operates by an extension of the first psychogram to include the two features of bell and sight of food either of which serves as a tag to implement the psychogram.

It may be observed that in many ways we become conditioned to react to various stimuli associated with a primary stimulus—a phenomenon which may have far-reaching results which we need not pursue.

As bearing on the idea that the germ plasm itself involves the psychic factor, we may cite from Bayliss (p. 506) the following account of the Pavlov experiment :

" Recently some interesting facts on the heredity of conditioned reflexes have been obtained. In a litter of mice the establishment of a conditioned reflex to a sound was effected after 300 repetitions of the stimulus. In the next generation of these mice the reflex was established in about 100 trials, in the third generation after 30 repetitions of the stimulus, in the fourth after 10 and in the fifth after 5. The experiments, if confirmed, will show that the predisposition to the development of a conditioned reflex

may be inherited." These experiments have not been confirmed, but others on similar lines are in progress and appear to promise analogous results.

As the theory of evolution develops it will probably be more and more essential to take account in some way or another of the interpenetration and mutual reaction of the physical and psychic factors. The notion of a psychic element in the germ plasm, carrying psychograms created by past experiences may be helpful.

On the whole, it appears to us that the etheric transformation sketched above offers the best solution of the ideo-motor problem—that transformation of motor-ideas into motor impulses which undoubtedly takes place. There seems to be no *a priori* improbability in the hypothesis that the impulses which are liberated or initiated in order to implement a motor-idea, are carried from the psychical region to the physical region of the cortex by means of etheric waves. If then considerations of the synthesis of sensations lead to the conception of a non-material psychic brain, we find the same conception in harmony with a possible theory of ideo-motor action.

SUMMARY

The execution of a motor idea may involve the co-ordinated action of many muscles. This necessitates the idea being analysed into various muscular units each of which is actuated through its own nervous path.

The distribution of a complex nervous impulse through the required paths is secured by variation of the resistances of the synapses in these paths, thus permitting the impulse to flow to the required muscles.

Upon our hypothesis the reduction of the resistance of the required synapses is due to the impingement of etheric waves.

Every synapse has one particular note to which it responds. When the right etheric chord is sounded the required synaptic paths are opened.

The exchange comprises the whole gamut of etheric resonators over as many octaves as are required.

The impact of the motor idea upon the exchange sounds the resonators corresponding to the muscular units involved in the motor idea and the resonators of the synapses respond to the exchange resonators.

For the formation of a motor habit the facility of striking the right notes in the exchange to produce the required movements has to be acquired by a process of trial and error. In the process of learning the required synaptic chords and sequences, a psychogram of chords and sequences is established which is associated with the particular motor idea.

When the motor idea is required to be implemented the motor idea extracts the associated psychogram and so determines which notes shall be sounded by the exchange.

According to this hypothesis the establishment of a habit depends upon the formation of psychograms which determine the flow of nervous impulses along the required paths, and *not* upon the formation of nervous paths of least

resistance, which would interfere with the normal working of the system of reflex arcs for voluntary movements.

The tunes to be played are governed by the psychograms and the strings of the instrument are left intact for any required tune—not permanently tampered with for the production of the particular tunes.

The formation of a conditioned reflex is easily accounted for on this theory by the establishment of the requisite psychograms. The repetition of the secondary stimulus under appropriate conditions operates as a suggestion and (as in hypnosis) results in a psychogram associated with the primary stimulus.

There is no reason to suppose that any nervous or protoplasmic change is involved.

CHAPTER VII

THE TRANSFORMATION OF IDEAS

THE facts of wireless telephony demonstrate that ideas can be transformed into etheric waves and vice versa. Ideas are put into words, transformed into sound vibrations in the air, then into molecular vibrations of the telephonic transmitter, then into the etheric waves which travel through space, then again into the molecular vibrations of the telephone receiver, then into sound vibrations in the air which carry to the ear the words which represent the ideas transmitted. Thus there exists an intermediate condition in which the ideas exist simply as etheric waves. Of course these particular etheric waves are of a very artificial character, consisting of the electrical vibrations produced by the transmitter superimposed upon the Herzian waves of the wireless apparatus. But this is nevertheless a demonstration that ideas may be transformed into etheric waves and so transmitted to a suitable receiver. Hence ideas in the course of transmission have a *real physical existence*—whether as waves in the air or as waves in the ether.

As between the cortex and the exchange this is, in our view, the method of transmission. Etheric waves transmit sensory impressions from the cortex to the exchange, whence they are received as ideas in consciousness together with

relevant ideas drawn from the mnema. In the reverse direction motor-ideas proceeding from consciousness impinge on the exchange together with relevant psychograms drawn from the mnema and give rise to etheric waves which are transmitted to the cortical resonators to initiate ideo-motor activities.

Let us consider how such a transformation of ideas may be conceivable. We have an example of it in the aerial vibrations of musical sounds. With the seven or eight octaves of musical notes—say 100 notes in all—an endless variety of musical meanings may be expressed.

A musician of the calibre of Beethoven, taking the score of a sonata reads it like a book, and appreciates the *musical meaning* of every chord, without hearing it. These notes and combinations and sequences of notes may be made to express every kind of musical meaning, and when transmitted through the air the musical ideas exist in an intermediate state as vibrations in the air.

But we can get a much closer analogy with etheric vibrations themselves. These exist of every kind of wave length. There are the waves a mile or more in length which are used in wireless telegraphy. There are the much shorter waves which we sense as heat waves. Shorter still are the light waves, shorter still the photo-chemical rays and shorter still the X-rays. Still more minute are the wave lengths of gamma rays and there are probably still shorter wave lengths. It is to these very short etheric waves that we are inclined to attribute the transmission of ideas, and many octaves of such short wave lengths may be available. Consider the enormous shades of colour

meanings which are obtained from *one single octave* of wave lengths of the order of one fifty thousandth of an inch which gives us the visible spectrum of red to violet. The spectrum from iron in the electric arc contains thousands of bright lines each representing a different colour and wave length. Here we have an immense range of colour meanings to each of which belongs its definite rate of etheric vibrations of definite wave length. All these etheric colour waves pass through space carrying their definite colour meanings. When these waves impinge on the retina their colour meaning is appreciated, whether it be in the blend of all the vibrations of the octave which is appreciated as white light, or in the various chords of vibrations which carry their own shades of colour meaning. But we can carry our analogy further. When we look at a landscape the retinal picture is the product of the light waves of various rates of vibration, the combination of which gives us the complete vision of the landscape. Etherial light waves furnish the complex picture. In the same way in our view etheric waves of suitable wave lengths are capable of giving us a psychic picture of equal complexity, in which the ideas presented in consciousness correspond to the rates of vibration of the ether waves.

It will now be appreciated that in our view a range of etheric notes or waves, of perhaps a few octaves, is capable of carrying the whole range of ideas and elements of ideas which can be appreciated by the human mind. Such ideas are of very varied kinds. Auditory ideas would include all sorts of sounds, including words which may have no meaning for the recipient, as in the well-known case of the

domestic who in a fever recited whole passages of Hebrew which she had heard her master read. In some cases of automatic writing Latin words have been written which had no meaning for the writer. Visual ideas would include pictures and images of scenes and objects. Ideas of concrete objects would include not merely their appearance but also, especially in the case of a blind man, the tactile sensations to which they had given rise. Abstract ideas would include the notions of science and philosophy for the partial expression of which new words had to be coined. We say the *partial expression*, because such words as " ionization " and " epiphenomenon " are only tags which draw from the mnema the groups of ideas which they connote. In fact we may regard every idea which it is possible to entertain in memory or in thought, as expressible by notes or chords of the etheric gamut, even though such an idea (as is the case with some motor ideas) may be inexpressible in speech.

We regard all interchange between the material brain and the psychic brain as taking place by means of etheric vibrations and this may take place in either direction. From the cortex to the exchange sensory impressions are in our view transmitted by etheric vibrations and from the exchange to the cortex motor-ideas are also so transmitted. In what way are ideas from the mnema or the exchange to consciousness or vice versa transmitted? In the case of sensations we found them transmitted by nerves to widely separated nerve endings in the cortex. Hence the necessity arose for postulating transmission to the region of integration by etheric waves. But to get

from the mnema to consciousness there is not necessarily any gap to be crossed. Possibly ideas from the mnema and the exchange are conveyed to consciousness by etheric waves but it seems more probable that we must regard both the mnema and the exchange as open to or merging into consciousness. Here, however, we are up against something which seems at present outside the range of rationalization.

We may note in passing an interesting corollary to the conclusion that ideas in transmission have a real physical existence as etheric notes or chords. If ideas are transmitted in French or German or any other language they give rise to etheric chords which are totally different. But it is easy to conceive of an etheric chord which should transmit the pure idea, apart from any word. Such a language we might term a language of ideas. There are many ideas which are inexpressible in words, as we find when we struggle for and fail to find a word to express some idea. In particular many motor-ideas are inexpressible in words. It is true that we may find words which convey such an idea partially. The listener says, " Yes, I know what you mean," but he can no more express it fully in words than the speaker. Take for instance the motor-ideas involved in the complex of movements of head, eyes, hands and body, etc., required to aim a gun at a bird in flight and bring it down. The motor-idea in the mind of the sportsman is clear, and in our view the impact of the motor-idea upon the exchange analyses it with the aid of mnemic psychograms into its complicated muscular elements and operates all the required synapses. But the implementing of the

motor-idea obviously takes place without the ideas involved being thought of in words ; yet it must exist in the mind as an idea and be analysed into its constituents which operate the synaptic sequences required for the movements. This would involve the expression of these wordless ideas in the intermediate form of etheric chords and notes. We therefore realize the existence of some absolute ideas apart from words and it is only one step further to the realization that a hundred different words which in as many different languages express the same idea may correspond to one absolute idea which may be expressible as a definite chord of etheric notes.

We have already remarked that few words give in themselves full effect to the ideas to which they relate. The various connotations of the word which are supplied by the mnema are usually essential to the apprehension of the idea. Take for instance the word " solid." It brings to our mind a group of connotations which include more or less ridigity and impenetrability and definition of form. The idea of solidity is a compound idea. The word without its mnemic connotations, which by a child are gradually learned and stored up, would fail to convey the complete idea. Or take as an example the word which we require to express the nature of an etheric chord which may represent an idea absolutely, without reference to any words which may be used in any language to convey it. We might call it an absolute chord, or a universal chord, or a correspondent chord, or an ideal chord. None of these words completely represent the idea we wish to convey We may invent a word and call it an auto-chord (which

appears to be a new word since we cannot find it in a dictionary). But an etheric auto-chord will have no meaning until the various connotations which it involves have been associated with it. However, let us take the plunge and speak of an etheric auto-chord as denoting a group of etheric notes suitable to transmit an idea *per se* apart from any word which may stand for such idea in any language.

We may therefore realize the possibility of a universal language expressed in etheric auto-chords. When such auto-chords impinged on the mechanism of the exchange the idea would be expressed in consciousness (if it were capable of verbal expression) by such word or words as the word repertory of the mnema might be competent to supply. But such ideas might not be expressible in words, and the extent to which they might be so expressible would be dependent upon the vocabulary of the individual and upon the intrinsic nature of the ideas. If they were translatable into words these words would be in the language of the recipient whether he be English, French or Hottentot. This is the work of the exchange co-operating with the mnema. To the Hottentot the range of expressibility would be small. As regards motor-ideas, the same auto-chord would produce the like motor result without reference to any mnemic reportory of words, if we assume the Hottentot to be built on the same synaptic pattern as ourselves.

To the case in which we can find no word which exactly expresses the idea which is in our consciousness, we may find an analogy to the visible light spectrum. We have a host of words which express different shades of colour from

red to violet. But how many shades of colour we find in the spectrum which are inexpressible by any appropriate word. So with the ideal spectrum we may have a range of vibrations competent to express accurately every shade of idea. But whether these ideas can be expressed in words depends upon the vocabulary of the recipient and upon his power of grasping the idea.

How far etheric auto-chords may enter into the actual scheme of things we are of course ignorant, but it is as well to realize their possibility. Most of our thinking is carried on by words and images, but ideas of sounds and images which have no expression in words can also be transmitted as ideas. In the cases of automatic writing in a language unknown to the writer—such as Latin—the meaning being unknown to the writer, we assume that the etheric waves convey simply the idea of the word sounds. Again, in the cases of phantasms appearing at a distance in connection with the death of a person, some hundreds of which cases were investigated by Myers and Gurney, the telepathic explanation of such appearances which is generally accepted assumes that a visual ideal impression was conveyed by the etheric waves. We shall refer further to such cases in the chapter on telepathy.

SUMMARY

Ideas in the course of transmission have a real physical existence—whether as waves in the air or waves in the ether.

We have the analogy of the great range of shades of colour which are transmitted by the single octave of colour waves which produces the visible light spectrum.

The picture of a landscape on the retina, in all its variety of colour, is the product of etheric light waves.

Etheric waves of suitable wave lengths may produce an equally complex picture of ideas in consciousness.

Every idea which it is possible to entertain may be considered to be expressible in notes or chords of the etheric gamut.

All interchange between the psychic brain and the material brain in either direction we regard as taking place by etheric vibrations.

The translation of etheric notes or chords into words and ideas depends upon the storage in the mnema upon which the notes and chords operate as associative tags.

We can thus envisage the possibility of a universal language expressed in etheric auto-chords.

CHAPTER VIII

RECAPITULATION

It will be convenient to give a short summary of our hypothesis in connection with some of the details which have been postulated in order to present it in a compact form, premising that such details are only a tentative rationalization, not necessarily bound up with the main hypothesis.

In the view presented every animal has a psychic organ of an immaterial kind which helps to synthesize sensations and to store up and emit the results of experience. As worked out in relation to man, this hypothesis assumes that man is possessed not only of a material brain but of an immaterial psychic brain which is connected with the material brain not by nerve fibres, but through the instrumentality of etheric waves. Both the psychic brain and the material brain are furnished with mechanism which gives out and responds to etheric waves. Such mechanism we may call " resonators," as a vibration of definite pitch in one set of resonators sets up a corresponding " note " or vibration in the corresponding resonator of the other set. Thus the resonators of the cortex radiate sensory impulses to the resonators of the exchange whilst the resonators of the exchange radiate ideo-motor impulses to the cortical resonators.

Ideas, whether motor, sensory, or purely ideal, may be expressed as etheric notes or chords, or sequences of notes or chords, and transmitted by etheric waves of various wave lengths. By notes we mean etheric vibrations of definite pitch. Ideas on the portion of the etheric gamut which serve this purpose may be compared with colours on the octave of the etheric gamut which consists of etheric light waves.

There is in the material brain a series of resonators (lying possibly in the cortex in the recognized sensory areas) which are tuned to different etheric notes. There is in the exchange of the psychic brain a series of resonators which cover the whole range of the etheric gamut which is devoted to ideas. Each resonator of the material brain is operated by the discharge of nervous energy which is the result of a peripheral sensory stimulus. Such stimuli are usually complex, but may be resolved into elements, each of which corresponds to a definite etheric note or chord. A sensory stimulus is thus translated into a chord or group of notes or sequence of notes. These notes represent a sensation reduced into the terms of a sensory idea, suitable to be compounded with other ideas from the mnema or elsewhere. These notes emanating from the resonators of the material brain excite the corresponding resonators of the exchange and reproduce there the chords and sequences from the material brain which represent the sensory ideas. At the same time the relevant mnemic ideas, the result of former experiences, are combined with the sensory ideas and are thus synthesized and presented to consciousness as a whole. It should be noted that in our

view the etheric notes which express ideas dynamically are not the ideas themselves, but a mode of transmission for reproduction as ideas in consciousness through the exchange. In the same way the notes of an orchestra exist in an intermediate stage as vibrations in the air, but are not appreciated as sounds until they fall upon the drum of the ear. So also etheric light vibrations are not appreciated as light until they fall upon the retina. The vibrations radiate in all directions, but have no significance which can be appreciated until they fall upon a suitable organ, the exchange, which transmits them to consciousness. A concurrent result is a record in the mnema.

Turning now to the rationale of voluntary ideo-motor activity, in our view motor ideas in consciousness, when the will to implement them is exerted, impinge both on the mnema and the exchange. From the mnema they extract the psychograms which by the result of past experiences have been associated with the motor ideas. These psychograms determine which notes of the exchange shall be sounded by the impact of the motor idea thereon. Every motor idea consists of elementary units corresponding to the required synapses. We regard every cortical resonator as having a definite note to which it responds, and which note when excited by the corresponding note of the resonator in the exchange reduces the resistance of the synapse so as to permit of the passage of the nervous impulse which is released by the voluntary effort accompanying the motor-idea. In this way the nervous impulse is permitted to flow to the effectors involved.

The formation of a motor habit consists in a series of

experiments which by a process of trial and error finally discover how to energize the appropriate muscles. One finally arrives at a synaptic chord or sequence which effects the desired movement or movements, and a mnemic record or psychogram of such synaptic sequences is made, which is associated with the desired movement. When the ideo-motor stimulus of the particular kind is given the associated mnemic record governs through the exchange the excitement of the appropriate notes required to implement the motor idea. In a sense, even the simplest voluntary movement is governed by habit, since it is only achieved as the result of experience which has correlated the motor idea with the synaptic notes to be sounded. We use the word "sounded" in the sense of setting up the etheric vibration.

Hence according to our hypothesis the psycho-physical gap between the material brain and the psychic brain is bridged by etheric waves. On both sides of the chasm we conceive of cells or organs which we may call resonators which can either generate or respond to etheric vibrations. On the material side we conceive the resonators as being built of protons and electrons. On the psychic side the resonators would be built of psychons. We conceive that such a psychonic structure like an electronic structure would be capable of either giving out or responding to etheric vibrations. The structure of electrical fishes shows that protoplasm is capable of furnishing electrical mechanisms. The hypothesis that psychons could also furnish such structures is suggested by analogy, since the psychons which we postulate are to be in all respects

analogous to the " ons " which constitute matter except that their mass is so much smaller that it is at present inappreciable by physical methods. But we already recognize such a difference of mass between the proton and the electron, which is 1,000 times less massive than the proton.

CHAPTER IX

THE ENERGY OF IDEAS

It is a matter of experience that when a new idea comes into the mind it may excite great mental activity. According to the intrinsic nature of the idea it gives rise to thinking and feeling processes which result in a flow of energy. We shall deal more fully with the flow of energy resulting from feeling processes or emotion in the next chapter.

The energy attached to or evoked by an idea is a familiar thing in some abnormal conditions of the mind. Thus in dementia the hallucinatory idea entertained by the patient will dominate his whole life. In compulsion neuroses the compulsion ideas of the patient evoke much energy, and so too in hypnosis.

But it is important to realize that this phenomenon of the potency of an idea which forces itself upon our attention when dealing with a lunatic or neurotic, is one of the ruling factors in every-day normal life. It is a matter of experience that certain ideas do operate in the normal mind to evoke energy and to excite mental activity. A new idea implanted in the mind will often operate to change the whole course of a man's life. The idea that matter is composed of electrons and protons has profoundly modified the thinking of scientific men. The vitality of the ideas implanted by the Salvation Army in the mind of an inebriate or a criminal has been known to transform the

man. The idea that mind is a mere function of the brain dominates the whole mental outlook of some biologists. The idea of the character of (say) Dick Turpin has started boys upon a career of imitation. The idea of the ether of space has been extraordinarily fruitful. The idea embodied in the falling apple led Newton along a wonderful path. The idea of the force of steam turned James Watt into a definite direction, and the idea of an iron road dominated the career of George Stephenson. When the change produced by an idea is great we cannot doubt that the activity is evoked by the idea, but in less obvious cases we must realize that the intrinsic nature of the idea may be such as to evoke energy.

The expression "evoke energy" should be carefully noted. The same idea may be presented to the consciousness of two different people and in the case of one may be fruitless and in the other potent. The energy which is evoked depends upon the individual recipient of the idea. The seed may be good but it may fall into barren ground.

Or to take a more useful metaphor, we may say that an idea evokes energy when it comes into the field of force of the ego. If a weight be hung up by a string in a gravitational field, when the string is cut the weight acquires kinetic energy by traversing the gravitational field. So we may figure to ourselves that when an idea traverses the field of psychic force of the ego it acquires energy which is measured by its subsequent activity. We must not carry this metaphor too far, since the assimilation of the idea by the ego and the chewing of the cud thereof (to change the metaphor) have also an important share in the

process. And it should be noted that, to make our theory include all the facts, we have to consider the field of force of the ego as extending outside the margin of consciousness, as we shall presently explain.

We do not know the nature of psychic energy. We have no accurate quantitative scale of measurement thereof, and we can only estimate its magnitude by its results. Its source and the method of its absorption by the individual are more or less matters of vague conjecture, and the theories of psychologists are inconsistent. Freud regards psychic energy as a transformation of libido as to which he says[1]:

"It will be expedient if I just introduce to you the term *Libido*. In every way analogous to *hunger*, Libido is the force by means of which the instinct, in this case the sexual instinct, as with hunger the nutritional instinct, achieves expression."

Psychic energy he regards chiefly as the transformation or sublimation of the urge of sex, and in *Totem and Taboo* he observes (p. 260): "I want to state the conclusion that the beginnings of religion, ethics, society and art meet in the Œdipus Complex."

Jung identifies psychic energy with libido, but he uses the term libido in a different sense from Freud. He says[2]: "The libido concept . . . merely signifies the energy of the process of life. Its laws are the laws of vital energy. Libido as an energy concept is a quantitative formula for the phenomena of life, which are naturally of varying intensity."

[1] *Introductory Lectures on Psycho-analysis.* George Allen & Unwin, p. 263.
[2] *Psychological Types,* Kegan Paul, p. 262.

It has been said that mental energy or psychic energy is a mere metaphor, and that it is really a mere transformation of physical energy. There is no sufficient evidence to support this view, and it is contrary to the facts of experience. The exhaustion of psychic energy is as much a fact of experience as that of physical energy. If we carry out a laborious physical task, we at length become conscious of physical exhaustion. If we try to solve a knotty intellectual problem we find that the ultimate result of continuous hard thinking is psychic exhaustion. In either case something which we call energy has been used up. For psychic exhaustion of energy a round of golf may result in a renewal of psychic energy while it uses up physical energy. There may be physical concomitants accompanying the exhaustion of psychic energy, but nevertheless we have good grounds for regarding physical energy and psychic energy as belonging to different categories. There may however be a relation between them. Thus when the will of the operator initiates a voluntary movement, we must regard the exercise of the will as involving psychic energy, whilst the resulting movement absorbs physical energy. It seems that we must regard the outflow of psychic energy as a trigger which liberates the physical energy. It is obvious that the exercise of the will does not *supply* the physical energy of the movement.

Whence does the ego get its supply of psychic energy ? We know the source of physical energy, which we trace to the sun. By analogy we should trace the source of psychic energy to some central source external to ourselves. In

any case the idea of the individual as a creator of psychic energy is unthinkable. The psychic energy of the ego has in some way to be kept up to the requisite level, just as the store of physical energy in the body must be kept up to a normal level. In either case the store of energy at the disposal of the ego must come from without. We may fairly conclude that we live in a psychic environment and that in various ways we absorb psychic energy from this environment, as we do in fact absorb physical energy from our material environment.

Every new idea that we absorb, and every old idea in a fresh presentment, becomes a centre of mental activity—greater or less according to the intrinsic nature of the idea. The attention of the ego is directed upon the idea which may also have a feeling tone. Both the attention and the emotion are accompanied by a flow of energy from the ego. Let us take again as an illustration the idea of the earth's attraction suggested by the sight of the falling apple. Thousands of people besides Newton had observed this, who were familiar with the attraction of a magnet upon a piece of iron, and the idea of attraction between the earth and the apple must have suggested itself many times. The fruitfulness of this seed depended not only upon the nature of the seed but also upon the soil into which it fell. The psychic energy which this idea evoked before it resulted in the *Principia* must have been enormous. Newton's ego was the channel through which this energy flowed. We are justified in regarding the thinking process which the intrinsic nature of the idea evokes when reacted upon by the ego as supplying energy through the ego. We

shall consider in the next chapter how the feeling process evoked may have its share in the result.

The energizing of an idea by concentrated attention in consciousness, may be taken to be a fact of experience. When the mind's eye is concentrated upon the idea, various implications and corollaries of the idea arise in the mind. In this way an idea which initially evokes only a small amount of energy is reinforced by the considerations to which it gives rise in consciousness, and its final energy greatly increased. The original idea, such for instance as that engendered by the fall of the apple may be a sort of embryonic idea which grows under concentrated attention until the seed becomes a big tree. So the final energy of an idea depends upon its intrinsic nature, the force with which it was initially impressed upon the mnema, and the voluntary attention which is concentrated upon it when it is evoked from time to time. The feeling-tone which it evokes may further energize the idea or may provoke a conflict with the reverse effect.

But we cannot get a *flow* of energy from an idea. This would involve a sort of psychic perpetual motion, since such a *flow* of energy would involve a creation of energy. The flow of energy comes through the ego and is attached to the idea by the feeling and thinking processes in consciousness. But when an idea recurs from time to time it may well be that upon each recession into the mnema its active energy has been increased and therefore its capacity for evoking energy. Such increase of active energy may be supposed to deepen and sharpen the mnemic impression upon which the initial effect of the idea upon

emergence depends. We do not know what a mnemic record or psychogram may be like, but for our present purpose we may utilize the analogy of the record of a sound on a gramophone disc. The record has no energy, but when the disc moves in contact with the stylus sound is evoked. The nature of the record and the drag of the stylus determine the energy of the sound. Or we may compare a psychogram to an idea embodied in words printed on paper. The print itself has no energy but the idea embodied in the print has the power of evoking mental energy in accordance with its intrinsic nature. From these analogies it will be seen that we look upon the psychogram not as an active idea but as the record of an idea. The facts of psychology lead us to the view that an idea may exist in three phases : (1) The free phase ; (2) The dormant phase, and (3) The nascent phase.

1. *The free phase.* The free phase is the active phase in consciousness. Here the primary idea may be brought into juxtaposition and comparison with other ideas. Voluntary attention may be directed to it. A feeling tone may be excited. In these processes energy is liberated or evoked from the energy store of the ego. We may say that the idea becomes charged with energy—which we may think of as kinetic energy—an activity and an effectiveness in consciousness in relation to other ideas with which it becomes endowed by these processes. It may thereupon take the centre of the field of consciousness, becoming grouped with other ideas near the centre and pushing other ideas to or over the margin. The primary idea with a group of satellites may attain a permanent configuration

and a potency depending upon the intrinsic nature of the idea, the original force of the impact upon consciousness, and the energy which has been liberated by attention and emotion.

2. *The dormant phase.* When the free phase is ended, the idea sinks into the mnema, that is to say, makes a record in the mnema, the depth or intensity of which depends upon the energy which the idea or group has acquired. We may regard this energy as being expended in making this record or psychogram. The idea or group is now in the dormant phase—much as if it had been written on a piece of paper and pigeon-holed. It has virtually ceased to be an idea and is now merely a psychogram, ready to bring the idea into life again with a force dependent upon the nature of the idea and the depth or intensity of the record.

3. *The nascent phase.* The third phase begins at a future time when by the traction of some associative tag the emergence of the idea from the dormant phase begins. We are compelled to describe this process in spatial terms, which of course only furnish an analogy. The interval from the mnema to the centre of the field of consciousness may be thought of as divided into two. One interval is that from the mnema to the margin of consciousness, the other is that from the margin of consciousness to the centre of the field.

In the diagram E may represent the centre of the field of consciousness, the dark line C the margin of consciousness and M the mnema. The field of force of the ego may be regarded as extending from E to M. The stage in which the

idea is passing from the mnema to the margin of consciousness, but is yet outside the field of consciousness we may call the nascent phase. It may be short, as the tag may be strong enough to bring the idea at once into the field of consciousness. If the tag be weaker it may not even reach the margin of the field of consciousness. But the facts compel us to recognize that the nascent stage is within the field of force of the ego, so that an idea in the nascent stage may be energized and play an active rôle although it has not reached the margin of consciousness.

Its emotional effect may come into play although the idea itself is outside the margin. It may act upon other ideas, may repel other ideas, may excite the feeling tone which belongs to it, or may operate the exchange to produce ideomotor action, although it remains in the nascent stage and does not reach consciousness. But a stronger associative tag may draw it out of the nascent phase into consciousness. It should be noted that we have for simplicity been tracing the course of a simple primary idea or group of ideas through the three phases. But two or more primary ideas of a conflicting nature may pass through these stages together. And in the case of conflicting groups of ideas they may be energized in the nascent phase and so absorb much psychic energy without the conflict being realized in

consciousness or with only a realization of the feeling tone. We are not for the moment concerned with the pathological results which may ensue.

The great importance of recognising the nascent phase will appear later. We shall in due course apply this three-phase theory to cases of complexes, repression, unconscious motivation and hypnotic suggestion, and we shall find that the recognition of this nascent phase, in which a nascent idea may be energized without coming into consciousness gives a good account of the phenomena.

The distinctness and intensity of a psychogram are important factors in the reproduction of ideas, but though the energy with which they may have been impressed may be small it may suffice for the reproduction. We may consider the case of a hypnotic subject to whom it is suggested that he is Napoleon, and who proceeds to assume the suggested rôle. Here the suggestion draws from the mnema the whole group of ideas which the subject has stored up in reference to Napoleon. These ideas lay dormant in the mnema, and perhaps have never been recalled by the subject since he left school. Nor would they probably have been originally impressed with much energy or emotional affect unless the subject were a keen student of history. We do not regard the energetic implementation of these ideas by the hypnotized subject as due to any energy of these ideas as stored in the mnema. We must regard the ideas as being energized upon their traction from the mnema, by the concentrated attention which is given to them in the hypnotic state, by the energy which is evoked by the suggestion of the hypnotizer and

probably also by the emotional affect which is communicated by him.

The importance of a clear and definite psychogram with reference to the accurate reproduction of an idea is a matter of common experience. When one wishes to do an act at a future time on the occurrence of a given associative tag, a mere intention may produce a very indefinite record. What is required is a forcible auto-suggestion picturing strongly the act to be done and the situation which is to call for its performance. The effect of a suggestion in producing a clear and definite psychogram is greatly reinforced by emotional influences. It is said that the potency of hypnotic suggestion depends upon an emotional relation between the hypnotizer and the subject. Repetition will also be a potent factor in producing an effective psychogram.

We shall deal more fully in a subsequent chapter with the case of conflicting ideas of opposed energy. In some cases we may recognize the existence of a secondary idea linked by association to the primary idea but antagonistic to it. In such a case when there is a tendency to draw the primary idea into consciousness the associated secondary idea acts as a drag upon it in the nascent phase, opposes its energy and prevents it from being drawn into the centre of the picture. For instance in the cases of forgetting cited by Freud in his *Psychopathology of Everyday Life* where the primary idea (the one to be remembered) is associated with an unpleasant secondary, which pulls the other way, there are always plenty of other ideas coming into consciousness which might tend to exclude the required

memory, and if it carried an unpleasant associate it may never be able to make its way through other ideas to the field of consciousness. There are various cases of ideas with conflicting energies to which we shall have to refer later.

For the sake of clearness it should be repeated that in speaking of the energy of an idea, we refer to the energy which it evokes in the free phase or the nascent phase, and that we do not attribute energy to it in the dormant phase, when it has, as it were, ceased to be an idea and only exists as a psychogram of more or less intensity. Furthermore this energy comes through the ego and is in some way derived from the psychic environment.

SUMMARY

Ideas have the property of evoking psychic energy through the play of the ego upon them.

The individual is not a creator of energy either physical or psychic.

Psychic energy must be looked upon as coming from outside the individual and being absorbed from his psychic environment, as physical energy is absorbed from the material environment.

We may regard an idea as being energized when it comes into the field of force of the ego, as a result either of thought or emotion directed upon it.

The fruitfulness of an idea or the energy which it evokes

depends therefore partly upon the intrinsic nature of the idea, partly upon its reception by the ego, partly upon the intensity of the mnemic record.

Ideas may exist in three phases :

1. The free phase, which is the active phase in consciousness.

2. The dormant phase, when the idea exists merely as a record in the mnema.

3. The nascent phase, in which the idea is extracted from the mnema, but has not reached the margin of consciousness.

The facts of psychology compel us to recognize that a nascent idea, which has not reached the margin of consciousness may yet be within the field of force of the ego, and so become energized and produce emotional or other effects.

Conflicting ideas may sink into the mnema and become energized in the nascent phase with various results but without reaching consciousness.

CHAPTER X

EMOTION

We do not propose to examine the general conclusions of psychologists except in so far as they touch upon or are related to the hypothesis of the psychic organ. The subject of emotion comes within our scope in so far as it stands in relation to the energizing of ideas. We may adopt the views set forth by Jung in his *Psychological Types*[1], as the basis of our excursus into this subject. He distinguishes four "basic psychological functions"—thinking and feeling, sensation and intuition—of which we are now only concerned with the first two. He says (p. 547): "I distinguish these functions from one another because they are neither mutually relatable nor mutually reducible. The principle of thinking, for instance, is absolutely different from the principle of feeling." He tells us (p. 543):

"Feeling is primarily a process that takes place between the ego and a given content, a process, moreover, that imparts to the content a definite *value*, in the sense of acceptance or rejection (like or dislike), but it can also appear, as it were, isolated in the form of 'mood,' quite apart from the momentary contents of consciousness or momentary sensations. This latter process may be causally related to previous conscious contents, though

[1] Kegan Paul & Co., Ltd.

not necessarily so, since, as psychopathology abundantly proves, it can take origin equally well from unconscious contents. But even the mood . . . signifies a valuation."

Again (p. 544):

"Feeling therefore is an entirely subjective process. . . . Feeling is also a kind of *judging*, differing however from intellectual judgment, in that it does not aim at establishing an intellectual connection, but is solely concerned with the setting up of a subjective criterion of acceptance or rejection. The valuation by feeling extends to *every* content of consciousness of whatever kind it may be. When intensity of feeling is increased an affect (Emotion) results which is a state of feeling accompanied by appreciable bodily innervations. Feeling is distinguished from affect (Emotion) by the fact that it gives rise to no perceptible physical innervations; i.e. just as much or little as the ordinary thinking process."

Jung uses the term affect as synonymous with emotion. There is no real line of demarcation between feeling and emotion, the distinction being really one of intensity, and the word affect may therefore be legitimately used to include the lesser as well as the greater intensity. A feeling affect may influence judgment though it does not rise to the intensity of emotion.

We may agree with Jung that (p. 545):

"The conceptual capacity of the intellect proves incapable of formulating the real nature of feeling in abstract terms, since thinking belongs to a category quite incommensurable with feeling—no intellectual definition will ever

be able to render the specific character of feeling in any adequate measure."

It will be observed that the word feeling as used above is distinguished from sensation. If, with Jung, we give up the attempt to define feeling we shall have to proceed by way of illustration. Well known emotions are—love, hate, joy, grief, fear, horror, rage, dismay, disgust, hope, despair, and so on. You may have a thought or idea of an emotion, you may give it a name, but that is a totally different thing from the emotion. Both ideas and feeling exist in consciousness, but in our view, whilst ideas impress the mnema, feelings as such do not impress the mnema, though the feeling affect which is evoked by an idea may have a considerable share in deepening the impression which the idea makes in the mnema and in energizing the idea when it is again drawn into consciousness. There is no psychogram of a feeling though there may be a psychogram of the idea of a feeling or of the incident or experience which gives rise to a feeling, but the emergence from the mnema into consciousness of the idea of a feeling, is a very different thing from the renewal of the feeling, even though the idea may have some feeling-tone. But a feeling may be renewed in consciousness by the emergence from the mnema of the ideas or experiences which originally gave rise to the feeling and were recorded in the mnema.

In the relation of consciousness to the ego we have two different reactions to consider, which we may describe as the thinking reaction and the feeling reaction. When the voluntary attention of the mind's eye is concentrated upon an idea, there is a thinking around the idea which may

increase its activity. The feeling reaction appears to arise primarily from the likes and dislikes of the ego (to use rather colourless words) or from the attraction or repulsion which the idea excites in the ego. The reaction of the ego to an idea or experience may cause a pleasant or a painful emotion. This of course may be emphasized by mnemic associations. Both the thinking reaction and the feeling reaction appear to involve a *flow of energy* from the ego to the idea. The feeling itself appears to be the recognition in consciousness of this flow of energy in relation to the affective nature of the idea which elicits it. Poets have thought of feeling in terms of colour. Red is associated with rage, green with jealousy and so on. One may look upon an emotion as metaphorically flooding the mental atmosphere with colour. But we will not attempt to describe a feeling. You can feel a feeling but not think it. An intense feeling may paralyse the thinking capacity. In the case of a more intense feeling the energy imparted may be such as to operate through the exchange and cause the physical phenomena which often accompany a strong emotion. The best we can do by way of description of an emotion is to give it a name, which will connote what our own experience has taught us as regards the meaning of the name, but will not reproduce the feeling. But in our view the feeling itself is not recorded in the mnema, since feeling is a state of consciousness, and the feeling is only reproduced in consciousness when the incident which produced it again emerges in consciousness.

The view that the feeling itself is not recorded in the mnema but only the incident which caused it is not always

recognized. Thus it is said that a soldier who had hitherto felt no fear in the presence of danger may when his tone is lowered by the continual strain of warfare become subject to fear. And it has been suggested that the fear was really always there but in a state of suppression below the threshold of consciousness. This is inconsistent with our view. In the normal man the reaction to danger is instant action, which leaves no room for fear. If the man's tone is lowered the promptness of the active reaction is impaired and in the moment of hesitation the reaction of fear emerges.

The flow of energy which is associated with a feeling affect will tend to impress an incident more firmly in the mnema. Thus it has been observed that the learning capacity of a person is greatly increased when engaged upon a subject in which he takes an interest, and that the memory is more retentive in such a case. The pleasurable feeling affect operates by facilitating the flow of energy to the ideas involved and therefore also by producing a deeper or more intense mnemic record.

On the other hand the feeling affect, if unpleasant, may tend to repress the idea so as to expel it more or less from the field of consciousness. It may result in the creation of a repressive psychogram which will always tend to oppose the emergence of the idea.

The feeling tone evoked by ideas by which a flow of energy is drawn from the ego may be operative in many cases where it is not obvious. It is not easy to grasp the nature of the feeling-tone attached to some ideas, which seem quite outside the realm of emotion. For instance

the idea of the attraction of the earth upon an apple seems to be a matter of dry science. Where could the feeling-tone come in ? The answer may be that each time the idea was brought into Newton's consciousness it evoked in the ego the hope of the solution of a great problem. Hope, the expectation of a great result dimly foreseen, the prospect of the realization of an end in view, these things would excite an emotion that would elicit from the ego a store of energy to bear upon the working out of the germinal idea.

A craving is a feeling attached to an unfulfilled idea.

Cravings which arise either from physiological or from psychical stimuli form a class of affective feelings of a distinctive type. In so far as these make contact with our primary hypothesis we must give them some consideration. The mechanism upon which they normally depend is that already described. In the case of a physical stimulus the sensations which impinge upon the exchange pass to consciousness together with the kindred ideas which are furnished by the mnema. The mind's eye is focussed upon the picture and the ego thus plays upon it with a stream of energy. This situation results in an affective craving or state of tension which can be relieved by methods which associated mnemic ideas suggest.

Of cravings which are physical in their origin hunger is the simplest. It has been attributed to a " gnawing " or " itching " sensation in the stomach. In the case of hunger the satisfaction or relief of the tension is obtained by eating. There is a mnemic record of the sensation of hunger and of the pleasant sensation of satisfaction which arises from

eating. But the mind may have dwelt upon the social causes which may have been responsible for the hunger, and of various means, revolutionary or otherwise, by which hunger might be avoided, and the mnemic record of these ideas may have far reaching consequences which we need not pursue.

The sexual urge is also, in its elementary form, the result of physiological discomfort. Sensations of discomfort pass through the exchange to consciousness together with the mnemic ideas which may have been associated with them. The mind's eye is focussed upon these ideas and the emotional element is brought into play. The ideas pass from the active phase to the dormant phase and the increased energy given by voluntary attention and the feeling affect intensifies the mnemic record. On a recurrence of the physiological stimuli and their re-emergence in consciousness the associated mnemic record fills out the picture in consciousness, fresh energy is acquired by voluntary attention, the craving becomes further intensified and also the mnemic record. The repetition of this process on each recurrence of the physiological stimuli may raise the craving to the highest pitch.

When the ideas associated with a craving are repressed it is often said that they are repressed with a charge of energy which causes pathological results, but we prefer to regard the energy as being imparted to the ideas either in the active phase or in the nascent phase on the emergence of the ideas from the mnema. It should be pointed out, however, that there are two kinds of repression, the one of which we should rather describe as *exclusion* than repression,

and it may be doubted whether exclusion has pathological consequences. When erotic ideas come into the mind it is a matter of experience that they may be energized by voluntary attention and letting the imagination play upon them until they attain a force which produces physical results. This process no doubt affects the secretions, and under these circumstances it is well understood that continued repression may have pathological results. Freud takes the view that the entertainment of erotic ideas may result in "sexual toxins." How these toxins may react physiologically it is beyond our purpose to enquire. But it seems obvious that repeated repressions which come too late to prevent the generation of toxins may operate in this way. On the other hand experience shows that from the kind of repression which takes place when instead of entertaining and chewing the cud of an erotic idea in consciousness, an immediate effort is made to switch off consciousness on to a totally different picture, no pathogenic consequences follow. This kind of repression is better described as exclusion. But this observation does not apply to cases in which habitual use of a channel has taken place. Where habit psychograms have already been established, a sudden exclusion of the attitude of thought and of the habit without adequate psychological substitutes frequently does lead to pathogenic conditions which are probably due to a physiological condition of affairs, in which the body resents a sudden disturbance of its normal routine even when the routine established has been of an abnormal character. And another exception must be made in the case of physical stimuli, the import of which is not

realized in consciousness, and the meaning of which may be completely disguised, but which nevertheless may produce pathogenic conditions. We refer here, particularly, to the various causes of the so-called Anxiety Neuroses and allied conditions.

It has been said that affective cravings do not reason, but relief of tension may come in various ways. When the primary object of a craving cannot be attained a substitute is often found which may be an image or symbol of an illusive character. This may in some cases be accepted as a satisfaction for the craving or at all events as allaying the craving. We do many things which have the effect of allaying an affective craving of which we do not recognize the significance. Thus a craving for a deceased relative may be partially satisfied by erecting a monument or dedicating a book. A craving for esteem or admiration is allayed by suitable or conspicuous clothing. A craving of a religious kind may be allayed by going to church. And there are many kinds of tension associated with affective cravings which may be allayed by going to the theatre, reading a novel, engaging in sport, etc., etc.

The physiological sensations and relevant ideas which are recorded in the mnema, may be extracted from the mnema by an associative tag at any time and reproduce the craving or emotion. This extraction may only reach the nascent stage, but the idea may thus come into the field of force of the ego without the idea itself reaching consciousness. Whether or no it reaches consciousness may depend on inhibitory determinants, but these may be of such a character that though the primary idea does not

reach consciousness, there may be a partial satisfaction of the nascent craving by an allied symbol which may reach consciousness. We shall return to this subject later.

Affective cravings of a psychical order may be illustrated by ambition—the desire to be or to do something. With some individuals this may be a stronger urge than any physical craving. With others the desire to benefit humanity in some way is a constant urge. Illustrations of such cravings may be found in the lives of men such as Lord Beaconsfield, Winston Churchill and John Howard " the philanthropist." A long list might be given but this will suffice. The craving for " righteousness " is one which with some individuals is a constant urge. Such cravings are undoubtedly dynamic factors in many lives. Sometimes they obtain an actual satisfaction ; sometimes only a symbolic satisfaction, as in a case of dementia where the subject imagines himself to be Napoleon.

The craving for the esteem of our social group is a vital determinant in our behaviour, and it is well illustrated by the attitude of boys in a public school. The craving for our own self-esteem is also often a potent factor.

We have enumerated love and hate among the emotions but Shand's[1] analysis shows that a more precise classification is necessary. In their momentary impulses they have an emotional character but their settled dispositions are of a different order and are classified by Shand as Sentiments. The word is not very appropriate, as it primarily connotes a feeling, but we must make use of it incidentally.

[1] *The Foundations of Character.* Macmillan & Co.

In this view an emotion is a transient phase in mental life, whilst a sentiment is a permanent mental disposition with reference to an object.

The distinction is clear when we consider that a particular sentiment in different situations may give rise to very different emotions, whilst totally different sentiments may give rise to almost identical emotions. Thus a sentiment of love towards a person may in different situations give rise to emotions of joy, grief, anger, jealousy, etc. A sentiment of hate towards a person may in other situations give rise to the same classes of emotions. A sentiment is thus regarded as part of the " mental structure " of the individual instead of a mere mental phase. In terms of our theory a sentiment consists of a constellation of ideas associated with an object, which is represented by a group of psychograms in the mnema forming a more or less permanent mental disposition in relation to the object. It may be compared with a complex in being a constellation of ideas related to a central core. An emotion is not a permanent but a passing phase in mental life.

Sentiments may be related to very different classes of objects other than persons. Places and things may be the subject of a sentiment—an old garden, a favourite pipe. Religious and political creeds usually have a sentiment attached to them. Self-love is a potent sentiment. It is therefore clear that a sentiment may easily pass into a complex and that no sharp line of distinction can be drawn between them. In the words of Miss Edgell[1] " Sentiments may so fix lines of conduct that variation for better or for

[1] *Mental Life.* Methuen.

worse may become well nigh impossible ; similarly, sentiments may so harden lines of thinking that flexibility of thought is lost." At this stage the Sentiment is almost indistinguishable from the Complex. Both may include compulsion ideas of notable force, which are registered in the mnema. Both may give rise to emotions when recalled into consciousness or into the nascent phase. Both may oust the operation of the judex and so warp mental decisions. But on the other hand an organization of sentiments may form a notable feature in the " foundations of character," and must form a large part of the permanent mental dispositions of us all.

SUMMARY

The ego is related to consciousness by an emotional or feeling reaction which differs from the thinking reaction.

The reaction of the ego to an idea or experience may cause a pleasant or painful emotion.

This feeling reaction involves a flow of energy in relation to the idea or experience which may be either intensive or repressive.

The feeling itself is the recognition in consciousness of this flow of energy.

The idea or experience which gives rise to an emotion is recorded in the mnema, but there is no psychogram of the feeling.

The flow of energy which is manifested as feeling is

attached to the idea or experience when it emerges from the mnema in either the active or the nascent phase.

An experience which is only recalled into the nascent phase may produce emotional results.

A craving is a feeling attached to an unfulfilled idea which may be either physiological or psychical in its origin.

The repression of a craving which has been energized by voluntary attention and entertainment may have totally different results from those which follow from exclusion.

When the primary object or idea cannot be attained a substitute is often found which allays the craving.

This may be an image or symbol or experience of an illusive character.

A sentiment is a more or less permanent mental disposition towards an object, as distinguished from an emotion which is a transient phase of mental life.

A sentiment may be regarded as a group of psychograms having relation to an object.

A sentiment in some aspects is indistinguishable from a complex and may have similar results.

CHAPTER XI

"THE UNCONSCIOUS MIND"

THIS expression is often used as if the mind were separable into two or even more compartments. There is no doubt outside the margin of consciousness a region which is traversed by nascent ideas on their way to consciousness. But that to which reference is usually made as the "unconscious mind" is not really a part of the mind but of the mechanism which serves it. Both the material brain and the psychic brain are in our view mere organs of the mind, not to be confused with the mind itself. The mnema we regard as the storehouse of memories and experiences, which are often attributed to the "unconscious mind." But we may without confusion refer to all this storage as "the unconscious," because we are in fact unconscious of all the storage in the mnema until it is drawn into or emerges in consciousness.

The motivation of acts and thoughts from the unconscious, by a process which may be either quite unconscious or only partially revealed in consciousness, is of great importance. This unconscious factor operates in things both great and small. It is often difficult to say whether a given motivation is wholly unconscious or whether there is some marginal consciousness involved. The operation may be, as it were, just inside or just outside the margin of the field of consciousness. When the mind's eye is

directed upon ideas near the centre of the field of consciousness, there is only a dim apprehension of ideas at the margin. Thus with a clock ticking in the room whilst the attention is focussed upon the subject upon which we are writing, we may say we are unconscious of the ticking, though we notice its absence immediately if the clock stops. But for practical purposes such a marginal consciousness, though we may subsequently apprehend it by introspection, that is by, as it were, questioning a mnemic record, may be classified with the unconscious, and it may produce practical effects which at the time are unrecognized. In the course of psycho-analysis or auto-analysis, both of which processes are a sort of questioning of the mnemic record, unnoticed motives are often disclosed. All such unconscious motivation we attribute to complexes, suggestions, habits, and determinants of various kinds related to psychograms in the mnema which may give rise to nascent ideas which may be energized and operate automatically near or without the margin of consciousness—whether within or without the margin it is often difficult to say. Let us proceed by way of illustrations.

We may begin with the consideration of a habit. Lloyd Morgan[1] has pointed out that instinctive action is congenital and prior to experience, whilst habit, or acquired mode of action is the result of experience. Thus with young chicks, the pecking action which they exhibit he attributes to instinct, whilst the discrimination between nasty and nice caterpillars is the result of experience. Whether the congenital instinct is part of the physiological

[1] *Habit & Instinct* Edward Arnold.

or psychical make-up of the organism may be open to doubt—that is to say whether it is lodged in the brain and nervous system or in the psychic organ. But in our view the acquired experience is lodged in the psychic organ or mnema and will ultimately result in unconscious action.

But we can see further into one of our own habits, and we may refer again to the writing habit, which in our view depends upon the mnemic psychograms of synaptic sequences. As a matter of experience the act of writing when the mind is occupied with the subject appears to be unconscious. It is true that we can, if we like, think of the spelling of every word as we write it, but even then we do not normally think of how to form the letters. The formation of the letters is an unconscious process. The chief part of our psychic energy goes to the elaboration of the subject matter. The minute flow of psychic energy which is devoted to the act of writing is directed by the writing psychograms through the exchange and goes to set free in orderly sequence the physical energy which is directed to nerves and muscles. Here then we have a good example of unconscious motivation, formation of the letters being usually on or outside the margin of consciousness.

Many instances of motivation which is either unconscious or on the margin of consciousness may be found in hypnotic experiments, examples of which are given in a subsequent chapter. Take for instance a post-hypnotic suggestion that the subject will at a future time do a certain act on the occurrence of a given associative tag. On the subject being subsequently asked why he did the act he may reply that he did not know that he did it, or that it just came

into his head. Such an act would in either case be implemented from the mnema through the exchange, and it may either not come into consciousness at all or only touch the margin of consciousness. If it were a trivial, ordinary act it would probably be done unconsciously. If it were an absurd act it would naturally when done excite the attention of the subject. But in either case the *motivation* would come from the unconscious.

Freud in his *Psychopathology of Everyday Life* records some scores of cases of unconscious motivation, from which he argues that the whole of thought and conduct are determined mechanically by determinants existing in the "unconscious mind," and that the operation of the will as a factor in conduct is a delusion. It is not our purpose here to deal with this argument, which has been considered by the writers elsewhere.[1] We have pointed out that in the whole of the examples given by Freud the actions were "determined without any exercise of the will. In every case the will is non-existent or is caught napping." But we may take the cases given by Freud as true examples of determination from the unconscious. Thus on going to the house of a friend, instead of ringing the bell, one may pull out one's own latch-key. There the associative tag of a door to be opened calls into operation the psychogram which through the exchange leads one to put one's hand into the pocket and draw out a key. This unconscious motivation would take place with all the more certainty if one's mind were engaged with other matters. In fact any

[1] *Determinism in relation to Psycho-Analysis.* Psyche No. 2. *A Neglected Complex.* Kegan Paul.

case of an established habit which responds either rightly or wrongly to an associative tag when the mind is otherwise occupied, illustrates unconscious motivation. The tag brings into operation the psychogram and through the exchange energizes the nerves and muscles, without consciousness taking any part in the process—merely recognizing when the act is done that something unintentional has happened.

So far a study of these trivial and more or less familiar examples presents to us the following features :

1. There is a record in the mnema which does not come into consciousness.

2. There is an associative tag which though itself sensory and appreciable by consciousness yet may not actually come into consciousness or only into the outer margin. Thus the door with its keyhole is a visual tag which leads to the unconscious production of the key.

3. The sensory tag is sufficient to operate the exchange through the mnema to produce the unconscious action.

It is necessary to enlarge the above *rationale* so as to include an ideal tag as well as a sensory tag, and so as to include the motivation of an emotion as well as of an unconscious action. There may be unconscious motivation of an emotion as well as of an action.

As an illustration of the unconscious motivation of an emotion we may take the case of claustrophobia given by Dr. W. H. R. Rivers in his *Instinct and the Unconscious*[1] (p. 10). This was ultimately traced to the subject having been at the age of four confined in a narrow passage with

[1] Cambridge University Press, 1920.

no means of escape from a dog by which he was terrified. Rivers observes (p. 107) :

" This patient not only affords conclusive evidence for the existence of experience shut off from consciousness under ordinary conditions, but his case shows that this experience, *though inaccessible to consciousness directly, may yet be capable of affecting it indirectly.*"

Upon our view this occurrence accompanied as it must have been by profound emotion, made a deep impression in the mnema, such that if the memory of the occurrence had emerged in consciousness at any time the emotion of fear would have been excited. Possibly the painful nature of the emotion induced a repressive determinant which tended to keep the occurrence out of recollection as to which we shall have more to say in the next chapter. But the closed space, such as a dug-out, would tend to draw the occurrence into consciousness partially, but not wholly—partially so that the emergence was sufficient to produce the emotional atmosphere of claustrophobia, but not so fully as to reproduce the incident in recollection in face of the counter-determinant.

In this case the dug-out, or other closed space, in which the doctor found himself, was the sensory tag. This sufficed to bring the mnemic record into the nascent phase in such a way as to reproduce the original emotion, although the incident which originally gave rise to the emotion of fear was not present in consciousness.

We are not immediately concerned with the reason why the mnemic records which cause unconscious motivation remain in the unconscious. There seems to be good reason

for accepting Freud's view that something of an unpleasant or painful nature is connected with the suppression of the original incident. This forgetting of the original incident may be an automatic process which protects consciousness against the recurrence of painful memories by the induction of a repressive determinant in the mnema which prevents the emergence of the incident in consciousness. We shall recur to this in the next chapter.

Many cases of unconscious motivation arise from the operation of a complex. Jung observes that "complexes are comparable to demons which fitfully harass our thoughts and actions." A complex is a constellation of ideas lodged in the mnema so as to form a powerful determinant. A complex may be set up in various ways. For instance it may be the result of a mental conflict in which feeling played a notable part, or it may be the result of a psychic environment which has given a definite impress. A complex may operate strongly in the determination of decisions, opinions, or actions. The judicial condition of the mind—the judex as we may call it—may be entirely set aside by a strong complex. It is a maxim of the Freudian school that the subject is unaware of such complexes. There are often compulsion ideas associated with a complex which by the energy which is evoked by them force themselves into the centre of vision in consciousness, but they are not appreciated by the subject as compulsion ideas, but seem to be rooted in logic and sound sense. That which is unconscious is that the subject does not recognize that such compulsion ideas are the mainsprings of his decisions.

As an illustration we may take the case of the con-

stellation of ideas which form a Free Trade complex, or a Protectionist Complex. Cases may be found where such complexes have been strongly and indelibly impressed in the mnema. They usually involve two classes of "compulsion ideas," those which support the ambit of the complex and those which are antagonistic to ideas which are in opposition to the complex. These we may call positive and negative ideas. When an idea in consciousness which is relevant to the complex exerts its traction upon the complex ideas, these may be drawn into the nascent phase or may come fully into consciousness. The positive ideas tend to monopolize the attention in consciousness, by which they are further energized. The negative ideas tend to hold back from consciousness antagonistic ideas, and to push to the margin counter suggestions which may be made by the other party. In the words of Dr. Ernest Jones—a psychologist of the strict Freudian school—the complex is exhibited in two ways, "in the minimum of evidence often necessary to secure the acceptance of an idea that is in harmony with existing mental constellations, or reject one that is incompatible with these. In both cases it is often the affective influences rather than intellectual operations that decide the question. The evidence is construed quite differently when viewed in the light of one affective constellation from the way it is when viewed in the light of the other."

The above case sufficiently illustrates the effect of a one-sided complex, the operation of which is often entirely unrecognized by the subject. He attributes his decision or opinion to reason and logic and is quick to find specious

reasons for setting aside any facts or considerations which are opposed to the complex. The complex ideas, energized by the voluntary attention of the ego may drive to the margin counter-ideas or never even permit them to come so far into the field of consciousness as to receive any attention. The whole process may be entirely unrecognized by the subject, and we may say that it is one of unconscious motivation.

Another case of unconscious motivation may be recognized in the emotional dislikes which some people display.

> " Some men there are love not a gaping pig,
> Some that are mad if they do see a cat."

One of the most common illustrations is the horror of mice which some women exhibit. Analysis will often reveal something in the unconscious which accounts for the extraordinary activity displayed when a harmless mouse is perceived in the neighbourhood.

Various odours, such as those of musk, patchouli, tar, etc., produce totally different feelings of like or dislike with different people. Here again it will usually be found that the feeling is determined by early associations of an agreeable or disagreeable nature which have become linked with the odour and recorded in the unconscious.

When a conflict has been completely resolved and a definite complex formed of such potency as to be inexpugnable, there is, so to say, an end of the matter. Whenever an idea relevant to the subject comes into consciousness the effect of the complex is to assimilate or reject the idea

as the complex dictates. But we may have a complex evolved from a conflict in which neither of the opposing elements has been victorious. The subject has never really faced the conflict in the sense of bringing it to a conclusion one way or the other. It may be that the anticipated result of the conflict has been so disagreeable that he has refused to carry it to a conclusion. The result is that both sets of conflicting ideas have been repressed and stored in the mnema ready to be drawn into the nascent stage or into the active stage and to evoke psychic energy from the ego. Here we seem to have all the necessary materials for a neurosis. Peace might have been obtained by the victory of either set of ideas, but it has not been so. The consequence is that both sets of ideas are liable to be evoked from the mnema from time to time upon slight provocation. The conflict is therefore renewed from time to time. Both the opposing sets of ideas may absorb much of the available psychic energy of the individual. Consciousness may become a perpetual battle-ground with results which psycho-analysts may reveal to us. It may be thought that this is hardly a case of unconscious motivation, but it results from an unresolved conflict in which the opposing ideas have been repressed from consciousness into the mnema, or the unconscious, and pathological results may ensue which are not traced by the subject to any conscious cause. And if the unresolved conflict is only drawn out into the nascent phase it may still work mischief.

All determinants lodged in the mnema even though they may not take rank as complexes may have effects the origin and result of which are little if at all realized by the subject.

When a matter gives rise to a debate in the mind, on which hangs a decision, whether of thought or action, opposing considerations are balanced by the judex. If no feeling tone is excited a strictly impartial, even if incorrect decision, may be the outcome. One after another the mind's eye is focussed on rival considerations, relevant materials are drawn from the mnema and a balancing and valuing mental process takes place in consciousness. But a relevant determinant drawn from the mnema may entirely upset this balancing process. Its potency is aided by the fact that its nature and origin may be unsuspected, and the judex is, as it were, biassed or deceived, by such materials derived from the unconscious.

It has been argued by some that we are at the mercy of such determinants, and it is true that when they are created we may be unconsciously motivated by them. But the fact is overlooked that we may create our own determinants —are in fact creating them day by day. As we have pointed out, a powerful auto-suggestion may create a determinant. But for the most part thoughts and acts of apparently trifling import by repetition build up by their cumulative effects determinants of power. This is a process which can be controlled by voluntary attention, and indeed determinants of a useful character may thus be stored in the unconscious.

The effect of a feeling-tone in forming a determinant or creating an unconscious bias is clear. A scientist who has formed an inchoate theory which he is testing by various experiments has to be on his guard in this matter. If his theory has got to the stage at which he has become

" attached " to it, this attachment creates a feeling-affect against which he must be on his guard—otherwise he will be liable to misread in favour of his theory experiments which really make against it. This has been often recognized—notably by Darwin who was accustomed to make a special note of any experiment the result of which ran counter to his views. Here we have a case of the will intervening to counteract the recognized effect of unconscious motivation.

It will be seen that our theory of unconscious activities is based upon the lodgment in the mnema, from one cause or another, of psychograms or determinants which are extracted as nascent ideas on the occurrence of associative tags, such nascent ideas becoming energized in the nascent phase and producing their appropriate reactions although they do not reach consciousness. It should be noted that we do not think of such ideas as sinking into the mnema with a charge of energy, but as being energized through the ego when they are drawn from the mnema into the field of force of the ego. It is the ego which we regard as charged with energy—drawn as to somatic energy from the material environment and as to psychic energy from the psychic environment.

SUMMARY

We may refer to all storage in the mnema, and to ideas in the nascent phase as " the unconscious," but the phrase " the unconscious mind " seems to be a misnomer.

Determinants of all kinds which have been recorded as psychograms in the mnema may produce unconscious motivation.

Habits may be taken as illustrations of unconscious motivation.

Post-hypnotic suggestions may give rise to unconscious motivation.

Unconscious motivation generally presents the following features :

1. There is record in the mnema which does not come into consciousness.

2. There is an associative tag the presentation of which may bring out the record in either the active or the nascent phase.

3. The effect produced by the tag may be sufficient to operate the exchange or activate an emotion.

A case of claustrophobia illustrates the unconscious activation of an emotion.

A complex may give rise to unconscious motivation either of thought or action.

The judex may be put out of operation by a complex or by the compulsion ideas associated therewith, e.g., a political complex, the operation of the complex being entirely unrecognized by the subject.

Emotional dislikes are often cases of unconscious motivation.

A complex may result from an unresolved conflict, in which case both sets of conflicting ideas may have been repressed into the mnema.

The recurrence of these ideas either in the nascent phase

or in the active phase may absorb much energy from the ego and give rise to pathogenic results.

Determinants which may deflect the judex are created from day to day, but this is a process which may be controlled by voluntary attention.

The effect of a feeling tone in creating a determinant was observed by Darwin, who was accustomed to make a special note of any experiment, the result of which ran counter to his views.

CHAPTER XII

"THE CENSOR"

OUR theory of the operation of psychograms will by following out the conception of the energy of ideas enable us to dispense with the conception of the apocryphal "Censor."

The mnema is of course crowded with records of ideas —so crowded that if we try to stop for a few seconds the flow of ideas into consciousness it is found to be an almost impossible task. The field of consciousness in which ideas are presented to the ego in juxtaposition as in a picture has a limited capacity for simultaneous presentation. When any subject is in the field of consciousness it draws ideas from the mnema by chains of association with the associated ideas. But there may be a large number of relevant ideas. They seek expression in consciousness, or rather the associative chains seek to draw them into expression in consciousness, but there is not room for them all at once. Introspection of one's own mind will reveal this crowding of ideas on occasion, seeking as it were to get into the picture. When the main idea is linked to a crowd of relevant ideas one is conscious that all of them do not come through. Some seem to be as it were just round the corner and unable to get into the picture. This is the experience of a public speaker who has to catch and utilize the best ideas he can seize

upon at the moment (and sometimes he is afterwards sadly conscious that some have escaped him). The ideas may be compared to people endeavouring to crowd through a narrow door. They jostle one another and the strongest get through at the expense of the weaker. A strong compulsion idea or a powerful opposing determinant may repel antagonists and prevent their emergence, just as the censor is supposed to do.

There is an instinctive reaction of the organism against pain whether bodily or mental. If for instance you accidentally touch something which burns there is an immediate and instinctive withdrawal of the hand. The mental reactions against painful emotions are not so simple. When a painful incident impinges upon consciousness an emotional atmosphere is excited—fear, horror, shame, disgust or other appropriate emotion. The more intense the emotion the deeper or more intense is the psychogram which the incident leaves in the mnema. This differs from a transient sensory pain in the liability of the incident to emerge from the mnema and revive the emotion. Any associative tag may draw it into consciousness and the emotional effect of the incident is again excited. This may be dealt with in two ways. The subject may endeavour voluntarily to repress the incident out of consciousness, in which case though consciousness may be eased for the time, the psychogram remains in full intensity and the incident may again at any time emerge into consciousness. The suppression is only temporary and leaves consciousness unprotected against a recurrence.

On the other hand an instinctive or automatic repression

of an unpleasant incident or idea may take place which will have the effect of more effectually barring the emergence of the incident into consciousness and may effect its suppression for years. Freud's theory of such automatic repression rests upon his conception of the "censor"—an entity which is supposed to keep watch over the door which leads to consciousness and prevents painful memories from emerging. According to the theory which we put forward, we must accept as a fact of experience the tendency of the mind to push out of sight a painful experience. This pushing, unconscious or otherwise, tends to create an anti-psychogram. A painful incident cannot be wiped out from the mnema, but it may be more or less repressed or kept out of consciousness by the induction of a repressive psychogram. The energy of the memory of the painful incident is opposed by the energy of the idea of the repressive psychogram. This process may go on outside or on the margin of consciousness and the result may be wholly to suppress the incident or only to permit of its partial emergence. The repressive psychogram may be voluntarily or artificially created or it may be automatic and instinctive. Why in some cases such an incident or idea should be more or less completely suppressed, and in other cases emerge from time to time, it is difficult to say. It must largely depend upon the idiosyncrasies of the individual and his temperamental attitude to life, and upon the nature of the incident and the sequence of other incidents, and also upon determinants previously stored in the mnema which happen to stand in a relation of opposition to the unpleasant incident or idea which

may depend on the combination of a series of small associative psychograms.

Upon our theory the automatic repression of a painful incident (which Freud attributes to the action of the censor) depends upon an instinctive reaction which creates what we may call an anti-psychogram, which finally sinks into the mnema together with the psychogram of the incident and opposes the emergence into consciousness. When an associative tag tends to draw the incident from the mnema into consciousness, the energy of the nascent idea connected with the psychogram of the painful incident and the energy of the nascent idea connected with the anti-psychogram are opposed to one another. The result will depend upon three factors—the energy attached to the incident, the energy attached to the anti-idea and the energy of the associative idea or tag which tends to extract the recollection. The energy attached to the anti-idea may be such that the incident may not completely emerge into consciousness for years until some exceptionally powerful associative tag draws it out. Or, as is often the case, where the repressive idea is less powerful, associative tags may revive an indistinct recollection of some feature of the incident, and bring it into the nascent phase, where it is energized sufficiently to bring the emotional effect more or less partially into consciousness—to lift, as it were, a corner of the veil.

To illustrate the matter we may refer again to the case of claustrophobia which is reported by Dr. W. H. R. Rivers.[1] The origin of the claustrophobia (which was

[1] *Instinct and the Unconscious.* Cambridge University Press, p. 170.

only traced after many years) was an occasion upon which the subject, when about four years old, was shut in a dark passage with a dog which terrified him. As the subject grew older the incident ceased to be recalled, but from time to time, when in a closed space, the emotion of fear was excited. In this case it appears that a strong anti-psychogram was automatically or in some other way set up, strong enough to repress the recollection of the incident, but not strong enough to prevent some feature of the incident together with the emotion of fear which accompanied it, being recalled into the nascent phase by the associative tag, which in this case was any closed space. The incursion of this emotion of fear was greatly increased when in later years the subject, who had become a doctor, went to the front during the war and had to work in a dug-out, when the most severe symptoms of claustrophobia set in. Many attempts were made by analysis to get at the root of the trouble but they failed to extract the incident. This was finally disclosed to the patient by a dream in which the associative tag was strong enough to revive the memory of the whole incident. Here we see that the anti-psychogram was strong enough to keep back the emergence in consciousness of the incident as a whole, but not strong enough to prevent corners of the veil, as it were, from being lifted from time to time by the associative tag of a closed space, sufficiently to permit the emergence of the emotion of fear. Finally a dream is said to have furnished an associative tag strong enough to overpower the anti-psychogram and bring back the memory of the whole incident.

An anti-psychogram may sometimes be created by suggestion. Dr. Rivers also relates the case of a soldier who went to look for a friend of his on the battlefield and was struck with horror on finding his dismembered body. Here the circumstances were apparently not such as to create automatically an anti-psychogram. The patient had tried actively to forget, i.e., to repress the incident, but without any useful result. Finally it was suggested to the patient with good results that the incident showed that his friend had died instantaneously without pain and that he ought to be thankful for this. In our view this suggestion created an anti-psychogram which tended to oppose the emergence of the incident with its emotional affect.

It appears to us that this theory of one idea fighting another idea in the nascent phase—just outside or on the margin of the field of consciousness—not only explains many difficult cases, but really furnishes the therapeutist with a clue which may be usefully followed in treatment of some psycho-neuroses. It is doubtful if a psychogram in the mnema can be obliterated, but an anti-psychogram of the right sort may prevent its emergence. This theory may be compared with the theory of the formation of anti-bodies to fight pathogenic toxins. These are automatically formed in many cases and sometimes succeed without intervention of the physician. In other cases anti-bodies are artificially introduced which serve the same purpose.

An anti-psychogram may be created by voluntary effort. Thus if you are reading or writing in a noisy room

you may by an effort produce an anti-psychogram which will more or less block the entrance into consciousness of the various distracting sounds. This may be compared with the effect of an inhibitory suggestion in hypnosis, such for instance as will prevent the subject from seeing a particular person. In our view such an anti-psychogram operates from the mnema through the exchange to block the passage of the sensory impulses from the cortical resonators to the exchange.

The theory of the automatic production of anti-psychograms seems likely to be more fruitful in practical applications than the theory of the censor. Voluntary repression of painful incidents has often proved to be quite ineffectual to produce their suppression. On the other hand the creation of an anti-psychogram has often been found to be effective.

The supposed entity called "the censor" is apparently very uncertain in its action. Often there is no automatic repression, and in such cases what has become of the censor? Most of us would be glad to have some unpleasant incidents kept out of consciousness, but "the censor" fails us. An unpleasant incident may come into consciousness just when one wants to go to sleep, but no censor avails to repress it. So capricious is "the censor" in its action that it is only here and there that it gives a complete account of the phenomena of repression. On the other hand the conception of a repressive psychogram or anti-psychogram appears to give a good account of all the phenomena of repression, and it indicates a means of either removing the suppression or enhancing

it as desired. This would depend on the use of suggestion in some form or another to intensify the repressive psychogram, if repression of a memory is desired. Or if the reverse is desired, suggestion may create another psychogram which will be in opposition to the existing repressive psychogram. But we can hardly think of such a process in terms of educating the censor. Even in the case of dreams we may regard the modification of the ideas emerging as due to the action of modifying psychograms.

A phenomenon allied to the so-called "censorship" may take place in consciousness. In consciousness itself it is a common experience to deliberately exclude unpleasant ideas, and the process by which this is achieved is worth examining. Let us take for example the case of a man who owes, say, £500 to his creditors. After examining the position and finding that he cannot possibly meet his claims, he may deliberately and consciously say "I will not think about this any more." He has probably done this by introducing a pleasurable idea with a strong affect, though purely an imaginary one, that he has plenty of money coming in, that business will improve, and that there is nothing to worry about. When, however, he gets a writ served upon him he may revert to his old depression and worry, for the energy of the illusory idea is not strong enough to combat the energy of the idea produced by the fact. In twenty-four hours, however, he may have again succeeded in repressing unpleasant ideas by further energizing the idea of ultimate solvency by volitional means. Such commonplace examples might

be multiplied indefinitely in which the deliberate volitional energizing of an idea in consciousness may succeed in excluding an unpleasant idea, but the conception of the " censor " is not required.

In the case of the repression of an unresolved conflict into the mnema, the pathological results often tend to provide some solution of the conflict in which the discomfort or inconvenience of the physical consequences is more endurable than the discomfort of the unresolved conflict. Here again we may regard the physical discomfort as producing a repressive psychogram which keeps the conflict from emergence, just as on the sensorial plane we find that a toothache or other annoying irritation disappears under the influence of a counter-irritant. In such a case, where Freud brings in the censor to account for the phenomena it seems a very inapt rôle for the censor to play. The rôle of suggestion acting upon the mnema to produce anti-psychograms seems a more useful theory.

A typical case is that of a soldier who suffers from a neurosis which results from a conflict between his desire to escape further horrors of warfare and his sense of duty. The past horrors and the expectation of future horrors and the conflict between inclination and duty result in morbid conditions which are positively relieved by the incidence of paralysis or other disablement. As soon as he realizes that he is likely to be unfit for further duty the conflict is resolved in a way which does not appear to involve any dereliction from duty. The psychogram which this idea creates effectually prevents the emergence of the conflict. Such a case is particularly difficult to

treat, since the disappearance of the disablement revives the conflict.

The theory of antagonistic determinants is strengthened by the consideration that in hypnosis and even in dreams a determinant of a moral character often acts as an anti-psychogram and prevents an immoral consummation of the dream or hypnotic situation. Thus if the suggestion to steal or to murder is made to a hypnotic subject who is of a normal moral type, the mnema will respond with the moral impulse which will prevent the immoral suggestion from being carried out. There seems to be no utility in attributing to a censor that which is the natural outcome of an opposing determinant.

SUMMARY

Freud's conception of the " censor " seems unnecessary and inadequate to account for the phenomena, which may be attributed to the operation of psychograms.

There is an instinctive reaction of the organism against pain, whether bodily or mental.

The automatic repression of a painful incident, attributed by Freud to the action of the censor, depends in our view upon an instinctive reaction which creates an anti-psychogram.

When an associative tag tends to draw the incident into consciousness the associated anti-psychogram exerts its effect, and neither idea may emerge in consciousness.

If the anti-psychogram is not sufficiently intense, the incident may be drawn into the nascent phase and produce an emotional effect.

The case of claustrophobia illustrates the different degrees of repression.

A repressive anti-psychogram may sometimes be created by suggestion.

The theory of the formation of an anti-psychogram may be compared with the theory of anti-bodies which fight toxins.

An anti-psychogram may sometimes be created by voluntary effort.

The censor is so capricious in its action that the theory rarely gives a complete account of the phenomena of repression.

The pathological results of the repression of an unresolved conflict sometimes tend to produce a solution of the conflict.

In such cases we may regard the discomfort of the physical consequences as producing by suggestion a repressive psychogram which keeps the conflict from emerging.

CHAPTER XIII

HYPNOSIS

The phenomena of hypnosis appear to be strongly confirmatory of our hypothesis, and their study throws much light on the normal working of the mind. Many theories to account for these phenomena have been put forward, but the theory of "Mental Dissociation," appears to be the most in vogue, and is discussed by Professor McDougall in his article on "Hypnosis" in the *Encyclopædia Britannica*. The following extracts from his article will give a general idea of this theory, and it will be seen that this theory may be readily worked out in terms of our hypothesis. Says he:

"An idea might operate more effectively in the mind and on the body . . . because it worked out its effects free from the influence of contrary or irrelevant ideas."

"Mental process consists in the interplay not merely of ideas, but of more or less complex dispositions . . . capable of remaining inactive or quiescent for long periods and of being excited . . . When its excitement rises above a certain pitch of intensity the corresponding idea rises into the focus of consciousness."

He notes that:

"It is a peculiarity of the reciprocal relations of all such dispositions and systems that the excitement of anyone to such a degree that the corresponding idea rises to

consciousness, prevents or inhibits the excitement of others."

And he points out further that

" Weaker and less intimate connexions will be practically abolished for the time being," and so " such idea or system of ideas will tend to work itself out and to realize itself in action immediately, without suffering the opposition of antagonistic ideas, which, in the normal state of the brain, might altogether prevent its realization in action. Thus the theory of mental dissociation regards hypnosis as a state of *relative* dissociation."

He further observes that in sleep and hypnosis :

" The general cerebral activity tends to subside, the free energy with which the cerebral neurones are charged ebbs away . . . the brain tends to come to rest," as in normal sleep. " But in inducing hypnosis, the operator . . . keeps one system of ideas, and the corresponding neural system in activity, namely, the ideas connected with himself, thus he keeps open one channel of entry to the brain and mind, and through this one open channel he can introduce whatever ideas he pleases ; and the ideas so introduced then operate with abnormally great effect because they work in an open field unchecked by rival ideas and tendencies."

A perusal of the whole article will show better than the mere extracts how this somewhat abstract theory may be worked out with the aid of the mental mechanism which our theory postulates. The separation of the material and psychic brains lends itself at once to the theory of dissociation.

The hypnotic state varies in depth with different subjects and with the degree to which the hypnosis has been carried, and the phenomena vary according to whether the hypnosis is light or deep. For our purposes it is not necessary to follow all these variations, and we propose rather to confine ourselves to general characteristics, which will sufficiently illustrate the application of our main hypothesis. It may be observed in passing that many of the phenomena of hyponsis will be seen to be quite inconsistent with the theory of " memory cells " in the material brain, but the hypothesis of the mnema and the exchange gives a satisfactory account of them.

In the hypnotic state we have to do with consciousness of a limited or abnormal kind—limited by the avenues to consciousness which are closed or kept open by the suggestions of the operator. Memory is active to the extent to which this is permitted by the suggestion. The intellect also is active, but it can act only upon the limited materials which are presented in consciousness. The whole course of the hypnosis is regulated by the suggestions implanted in the mnema. The phenomena of hypnotism indicate clearly that there is interposed, between the reception of sensory impressions by the brain and their transmission to consciousness, some mechanism by means of which, inhibitory suggestions may prevent the transfer of sensations, and the same mechanism is adapted to pass on illusory sensations. Suggestions implanted in the mnema may block the passage between the mnema and the exchange, or between the mnema and consciousness, or may draw from the mnema a particular group of records

to the exculsion of others. A powerful suggestion may hold the whole field and block the emergence into consciousness of any other materials.

In an article on telepathy by one of us[1] it was pointed out that the capacity for securing a " blank mind " was one of the chief conditions for telepathic receptivity. Not one person in a thousand can secure this condition. If you try to hold consciousness empty for even half a minute, you will fail. This condition of the " blank mind " may be secured by suggestion in hypnosis, as indeed is indicated by the fact that telepathic receptivity is greatly enhanced in the hypnotic state. That is to say, the mind is blank to all except that which the suggestions of the hypnotizer permit or supply.

One other important feature of hypnosis is the paralysis of the judex—i.e., the ego in the exercise of its critical faculty which normally rejects weird suggestions which contravene objective realities or established determinants. In the normal state the ego can at once repel such suggestions—a process which the available relevant materials in the mnema and the materials objectively supplied, render more or less easy. It does sometimes happen in hypnosis that the mnema furnishes a counter determinant which repels an antagonistic suggestion. Thus the suggestion to commit a crime is repelled by a strong moral complex. But a potent suggestion in hypnosis usually blocks the emergence of antagonists and the judex has no sufficient materials on which to operate.

In the normal state it appears to be important that an

[1] *Hibbert Journal.* April, 1922, p. 497.

external suggestion should be converted by adoption into auto-suggestion to have its full operation. An auto-suggestion if strong and definite forms a psychogram which is attached to an associative tag. When the tag presents itself the idea of the psychogram is extracted from the mnema and comes into operation as a determinant. Thus, if one is in the habit of walking daily by a particular route, and on some occasion it is decided to deviate on the next day from this route, one is apt to forget the intention, and to follow the habitual route. But, if on the preceding day when the intention is formed, one suggests strongly to one's self that at a particular corner on the route one will pause and take the required exceptional turning, picturing the corner definitely in one's mind and the alteration of route, the suggestion sinks into the mnema, and a psychogram is formed. When the associative tag (the definite corner) presents itself on the next day, it will draw from the mnema the suggestion, which will be operative, though completely forgotten up to that moment, it the auto-suggestion has been strong and clear.

The chief characteristic of the hypnotic state is the greatly enhanced power of suggestion. Suggestions result in psychograms in the mnema, competent to induce thought or action and anti-psychograms competent to inhibit antagonistic ideas or antagonistic sensory impressions. Such suggestion may be partly direct and partly indirect, but in all cases we get a rational explanation of hypnotic phenomena by regarding the suggestion as acting through the mnema either upon consciousness or upon the exchange in either the nascent or the active phase. In the first

place it should be noted that by surrendering himself to the hypnotiser every suggestion is accepted (unless there is already in the mnema a strong opposing counter suggestion), and this acceptance may convert the suggestion into an auto-suggestion. When a suggestion is made to operate post-hypnotically, it may appear to the subject to come from his own volition. In hypnosis the subject appears to do no independent thinking. His mind appears to be occupied entirely with the materials supplied by the hypnotiser and the relevant ideas which are stored in the mnema and brought out by association. His consciousness is limited to such materials. He accepts towards the hypnotiser the emotional attitude which he was accustomed to accept in childhood towards parent, nurse, or teacher. This emotional attitude of obedience to and faith in authority is transferred to the hypnotizer, and it may be that in the absence of this element the subject cannot be effectively hypnotized. In the hypnotic state the only channel left open to the objective world is that which the hypnotizer suggests. Every other channel is blocked by suggestion, explicit or implied. Thus, if he is told that a cat is a dog, the objective sensory idea of a cat is blocked, and the idea or hallucinatory image of a dog is supplied by the mnema.

In the initiation of the hypnosis the subject submits himself to the operator, which may have the effect of recording in the mnema a psychogram, which blocks every channel of approach to the subject's consciousness, except as determined by the operator. We may think of such a psychogram as inhibiting the operation of the exchange

resonators and preventing the passage of any sensory impressions through the exchange, which run counter to the suggestion. The mnema itself is open to consciousness, but the only flow of ideas from the mnema to consciousness is that which is determined by association with the suggested idea. The field of consciousness is therefore strictly limited, and this very limitation has the effect of bringing into prominence such ideas as are permitted to emerge. A suggestion, therefore, by its isolation, operates with extraordinary force, which is enhanced by the fact that the suggestion often seems to spring from the subject's own volition, as may be seen from the cases in which the subject is asked to give a reason for his acts.

Ideas may pass from the mnema either direct to consciousness, or through the exchange, or by both channels. We may use the term psychogram in its widest significance as denoting any kind of impression in the mnema, whether it be a simple or a complex impression. The effect of a suggestion may be any or all of the following :

(1) To elicit from the mnema the emergence of a group of ideas which may, as it were, fill the whole capacity of the channel from the mnema to consciousness, and prevent the emergence from the mnema into consciousness of any but very energetic antagonistic relevant ideas.

(2) To create a psychogram which will block the passage through the exchange of antagonistic sensations coming from the cortical resonators.

(3) To create a psychogram in the mnema which will transmit to consciousness suggested hallucinatory sensations.

Or finally:

(4) To create a psychogram in the mnema which will govern the operation of the exchange resonators and thereby transmit to the cortical resonators the synaptic sequences necessary to implement a suggested motor-idea.

When we speak of the operation of a psychogram, we mean that an associative tag draws the idea represented by the psychogram from the mnema either into the nascent phase or into the active phase, as the case may be, in either of which phases it may be energized and implemented. A motor-idea which is represented by a psychogram of synaptic sequences, may be energized in the nascent phase. In every case involving motor ideas, the mnemic psychogram operates on the exchange either to direct or to inhibit the operation of the resonators as the case may be.

The types of suggestion may be either motor, sensory, or psychic, and these may be either inhibitory or mandatory, but the classes are not clearly marked off from one another, and in some cases all these elements are present. Suggestions may also be delayed to take effect at a post-hypnotic time, and in this case, unless the associative tag is clearly defined, the suggestion may operate imperfectly.

We need not say much about mandatory motor suggestions. For instance, the subject is told that on seeing a certain person he will put out his tongue. Or we may refer to the case of a nurse who was told that every time she said "sir" to the assistant physician she would scratch her temple with the right hand. Such cases are of delayed suggestion, and they might be multiplied indefinitely. The suggestion with the associative tag sinks into the

mnema, and when the tag is in evidence the mnemic record produces the nascent idea which becomes energized and excites the exchange and so implements the motor suggestion, in the same way as an auto-suggestion or motor idea in the normal state would be implemented. But it is to be observed that the subject, when asked to account for the act, may deny that he did it, or may say that he did it unconsciously, or may say that it just came into his head to do it. The ideo-motor action is in fact carried out in the manner described in chapter xi. under the guidance of the mnemic record extracted by the associative tag.

With a suggestion of motor inhibition the point at which the inhibition takes place should be noted. For instance, with the simple suggestion " You cannot open your eyes," it seems clear that there must be inhibition of the established synaptic sequences for voluntary movement, the psychogram of which is already recorded in the mnema in connection with the idea of voluntary eye-opening. The suggestion creates an anti-psychogram which blocks the operation of these sequences at the point where, in the absence of suggestion, they would determine the operation of the exchange resonators for ideo-motor action.

In a case given by R. H. Vincent (*The Elements of Hypnotism*) it is suggested to a subject that on awaking he will not be able to see a particular person B. This suggestion is impressed in the mnema as an anti-psychogram. On awaking, the subject cannot see B. When a hat is placed on B's head the subject is astonished to see it suspended apparently in mid-air, and he looks about to

see if it is suspended by a string. The subject is told to hit out, and his arm is held fast by B, on which the subject complains of cramp in the arm, and still fails to see B. And so on. Where does this visual partial inhibition take place ? The image of B is undoubtedly on the retina, and we must assume that it excites the cortical resonators. But in our view the operation of the anti-psychogram in the mnema blocks the complex of notes from the cortex resonators which represents B, so that the picture passed on by the exchange to consciousness lacks the sensory elements, which are blocked by the psychogram.

Another illustration is furnished by a case given by Vincent. To an undergraduate it is suggested that he will not be able to write the letter *a* on awaking, the result being that in writing a passage from dictation he misses out the letter *a*, leaving always a blank space. Here again the psychograms of synaptic sequences are duly furnished for the whole dictation except for the letter *a*. The inhibitory psychogram referring to the letter *a*, blocks the psychogram of the letter *a* and prevents the passage to the exchange of the necessary synaptic sequences, so that letter *a* is omitted. This blocking we put at the stage when the mnema furnishes the psychograms for the synaptic sequences of other letters.

Vincent remarks (p. 117) :

" With reference to these particular inhibitions it is important to note that they range themselves in two distinct classes. The subject may be deprived of the perception, for instance, of a word or letter, and in consequence of the power to write it ; the *idea*, however, of

the particular word or letter he will or will not retain, according to the suggestion made. If he retain the idea of the word or letter, he is quite conscious of his inability to utter or to write it ; he is annoyed with himself on account of his inability, and will endeavour to avoid using it."

In the case given above the suggestion had been such as to inhibit both the idea of the letter *a* and the power of writing it. As to this case Vincent observes (p. 119) :

" The reader will notice that where the *a* occurs separately a distinct space is left, and this fact is of considerable psychological importance. The writer has often endeavoured in such experiments to obtain an explanation from the subject of his reason for leaving these spaces ; the only answer has been, however, that he does not know why ; and he generally seeks to fill up the gap, when it is pointed out, by prolonging the flourish of the last word."

In the following case related by Vincent (p. 118) it will be observed that the *idea* of the word was not destroyed, but the synaptic sequences for its utterance were inhibited by the anti-psychogram in the mnema.

" It was suggested to a boy in hypnosis that he would be unable to utter the word ' Mary.' On waking him the following dialogue ensued :—

" ' Now will you please repeat this sentence : " Mary had a little lamb." '

" Subject : ' *She* had a little lamb.'

" ' No. I said : " Mary had a little lamb." '

" S. : ' She had a little lamb.'

" ' Please repeat the sentence as I quoted it.'

" S. (after a pause) : ' *Polly* had a little lamb.'

" ' Will you be so good as to say " Mary had a little lamb " ' ?

" S. (indignantly) : ' Well, I told you she had a little lamb.'

" After many evasions and excuses he confessed that he could not pronounce the word ' Mary.'

" In the last experiment the subject was a boy, ignorant, and not of striking intelligence ; nevertheless, he endeavoured to get over the difficulty by every device in his power. He cannot explain even to himself his inability ; he is ashamed of it, and naturally tries to avoid exhibiting it ; if, however, he knew that it was on account of a hypnotic suggestion, he would not be discomforted, since then the explanation would be obvious to him and to those around him. But his consciousness knows nothing of the suggestion. When the subject is deprived of the *conception* of a letter, there is no manifestation of annoyance at his inability to write it."

The application of these considerations to certain cases of aphasia seems fairly obvious. The idea seems from various signs to be clear in the mind of the patient, but he is unable to utter the appropriate word. This we regard as being due to the fact that whilst the psychic mechanism is intact, the cortical resonators are so disorganized by the lesion that they fail to respond to the exchange resonators.

In cases of inhibitory motor suggestions, Vincent observes (p. 117) " the paralysis is not attended by total functional incapacity of any group of muscles interfered with ; but the function is interfered with for one particular purpose."

This is in accord with our hypothesis that the suggestion only blocks through the operation of the mnema upon the exchange, the particular synaptic sequences which are required to carry out the particular purpose.

The above cases show that we may have either a physical inhibition or a psychic inhibition, or both. In the case of the physical inhibition the psychogram affects the synaptic sequences. In the case of psychic inhibitions the psychogram blocks the idea.

The case of psychic suggestions is familiar, and they are frequently accompanied by inhibitions which are inferred without the necessity for separate expression. Thus the suggestion that a piece of soap, eaten by the subject, is a piece of cake, involves both elements. The sensory impression produced by the actual eating of soap must be inhibited at the point where the cortical resonators would operate the exchange resonators, but the psychogram giving the psychic impression of cake must be supplied by the mnema to consciousness at the same time that the mnema blocks the normal sensory effect.

Again, cases of complete or partial anæsthesia must be referred to the blocking by the anti-psychogram in the mnema at the point where sensations would normally be received by the exchange. Thus, if the appropriate suggestion be made, the smell of strong ammonia will be unperceived. We must assume that the cortical resonators are excited by the smell, but the anti-psychogram would prevent the exchange resonators from operating to pass on the sensation to consciousness.

A state of hyperæsthesia may be induced in hypnosis.

Thus Vincent (p. 146) records a case in which the subject, when in a normal state, could not hear the ticking of a watch beyond a distance of four feet. Under hypnosis he was able to hear it at a distance of twelve feet. In another case the subject was able to pick out a number of objects which had been held by different people and to identify the persons who had held the objects by comparison of the smell of the objects with that of the hands of the persons. Another case is that of the recall of things apparently long forgotten. Thus a Frenchwoman, fifty years old, began to speak English, of which she had no knowledge when awake, and which she must have acquired many years before. These cases may be accounted for by the increased concentration which is possible when all access to the objective world is cut off by the conditions of the hypnosis. No irrelevant ideas compete with the suggested idea for the attention. It should also be noted that telepathic sensitivity, which is rare as a normal faculty, is greatly increased in hypnosis for the same reason. The condition of a " blank mind," which is necessary for telepathic receptivity, is more easily achieved in the hypnotic state.

The following case is related by Vincent (p. 144) :

" A piece of paper is taken and it is suggested to him that it is a photograph. This sheet is then mingled with some fifty others of precisely the same shape, size and form. The sheets are given to the subject, and he is told to find the photograph ; he goes through the packet till he comes to the one on which it was suggested he should find a photograph. This he at once identifies."

We must attribute this to the state of hyperæsthesia accompanying the "blank mind." Small differences in texture of the paper would be associated with some points of the photograph, and would recall the mnemic impression, though they were imperceptible in the normal state.

But the following case, related by Vincent (p. 143) seems to call for a different interpretation. The suggestion to the subject was of a column of a dozen two-figure numbers on a blank sheet of paper. He could add these figures correctly as well as if they were written, or pick out (say) the first, fourth, and eighth, and add them together, but on taking the paper away he could not do it. It has been proposed to attribute this phenomenon to the association of the figures by the subject with minute differences in the texture of the paper, which were perceived by hyperæsthesia. What is clear seems to be that the subject had in his consciousness a complete picture of the figures associated by suggestion with the paper. According to our theory a psychogram of this picture was recorded in the mnema, which could only be extracted by its association with the paper. No theory of "memory cells" in the material brain seems adequate to account for the phenomenon, but the picture excited in consciousness through the exchange and the mnema, seems to give an adequate account of the matter.

That a picture in consciousness may be excited by suggestion, which has for the subject the complete aspect of reality, is shown by many cases. Thus we have seen a subject who was told that he and his wife were visiting an exhibition to which they had been a long time before.

The conversation of the man with his imaginary wife, in which he pointed out and commented on various objects in the exhibition, was absolutely realistic. The subject was one who had been treated by one of us for shell-shock, and there was no doubt that the performance was perfectly genuine. The suggestion had called forth from the mnema a complete realization of the exhibition and of the objects noted, and it was clear that to the subject they were as real as if the suggestion were a fact. We have to admit that such realistic pictures can be retained by the mnema, and though they cannot normally be recalled, yet in hypnosis, when by suggestion they are made the one subject of attention, all exterior channels being cut off, they can be absolutely realized. It may be observed that the above incident took place in a back garden in London, with houses staring the subject in the face. Yet these sensory impressions were entirely inhibited.

The same subject was given a job in the garden, and it was suggested to him that he was a person of Herculean strength. The result was that he worked like a Hercules and did an amazing quantity of digging in a short time. The effect of a powerful suggestion implanted in the mnema dominating consciousness was strikingly illustrated.

A suggestion may be so forceful that it operates in the normal state as strongly as if the subject were hypnotized. This is illustrated by the story of a butcher who fell and was caught and suspended by a hook. As a matter of fact, the hook only caught in his clothes, but the hook and the total environment led him to believe that the hook had entered his body, and he suffered agonies in consequence.

Here we must regard the psychogram registered in the mnema by the circumstances as operating the resonators of the exchange, and giving the incident a painful meaning in consciousness. The single mnemic impression must have been so powerful as to exclude everything else.

It seems clear that a psychogram may be associated with a sensation, and this is explicable on our theory that both sensations and ideas may be expressed as chords of etheric notes. Thus, with the suggestion that water is a nauseous medicine, the medicine idea would extract from the mnema a nauseous record, which would determine the operation of the exchange resonators directly.

In Dr. Waller's experiments an actual pin-prick and the threat of a pin-prick produce the same reaction on a galvanometer included in an electric circuit through the hands of the subject. In the case of the actual pin-prick the sensory idea of the pin-prick is carried to consciousness, and at the same time there is made an associated psychogram of the sensation as expressed by etheric notes in the exchange resonators. We may assume that the change of resistance shown by the galvanometer, results from the state of psychic tension caused by the sensation of the prick. In the case of a pin-prick threatened by jabbing at the skin without actually touching it, the idea of the pin-prick causes the associated psychogram to emerge, and cause the same state of tension as an actual prick. An account of some experiments of this kind with a hypnotized subject made by one of us with the assistance of Dr. Waller, is given in *Pleasure and Pain*[1] (p. 37). They show how

[1] By Paul Bousfield. Kegan Paul & Co.

the illusory suggestion given to the hypnotized subject reacts.

In a simple case of psychic suggestion it was suggested to a subject that he was a pig, with the result that he crawled about grunting and snorting, and in another case that the subject was a dog, with the result that he tried to bark and bite. These appear to be cases of a psychic or ideal suggestion in which the material for implementing the idea is drawn by association from the mnema.

In carrying out a psychic suggestion the subject is no doubt playing the part of an actor, but quite unconsciously. The success of an actor depends on his identifying himself with his part. He should not only act the part, but think the part and live the part. In hypnosis, with its concentration on an idea and its seclusion from every kind of external influence except that which comes through the operator, the subject cannot do otherwise than live the part, so far as he knows it. The suggestion passes through the exchange to consciousness, associated with the mnemic record which belongs to the suggested idea. When these arrive in consciousness the subject implements them as if the idea and the volition involved in the suggestion were his own. This limited consciousness is the result of the original submission to the hypnotizer, which may be said to create a mnemic record which blocks the approach to consciousness of any but the selected idea. The relevant exchange resonators are kept silent by the antipsychogram which is recorded at the beginning of the hypnosis, which blocks mnemic and objective ideas at variance with the suggestion made by the hypnotizer.

We may now summarize our final view of the operation of the mnema and the exchange as illuminated by the study of hypnotic phenomena. We can see further into the working of the mind in hypnosis, and if we regard such working as analogous to the normal working, only modified by the limitations imposed in hypnosis, we get valuable clues to the normal working.

Thus we gather that even in the normal state all sensory impressions must be considered as passing to consciousness through the exchange, since by the operation of the mnema upon the exchange, all sensory impressions can be blocked from consciousness in hypnosis.

In hypnosis any psychic suggestion, such as that the subject is Napoleon, completely dominates the emergence of ideas from the mnema and permits only the flow to consciousness of the group of ideas connected with the suggestion. From this we may infer that, even in the normal state, related ideas are grouped together in the mnema. Further that any powerful determinant or psychogram will tend to inhibit the emergence of other ideas, which again throws light on the normal operation of a complex.

The establishment of conditioned reflexes appears to depend on suggestion. (See pp. 93, 212.)

The following incidents of hypnosis will also be found to throw some light on the normal working of the mind.

Any compound sensory and psychic suggestion, such as that water is whiskey, inhibits in the exchange the passage of the actual sensory impressions and supplies from the mnema the ideal impressions associated with the suggestion,

Any motor suggestion, such as putting out the tongue when some associative tag is presented, is implemented by the operation of the mnemic psychogram upon the exchange resonators to produce ideo-motor action.

Any inhibitory sensory suggestion, such as that a certain person cannot be seen, is operated by the mnemic psychogram inhibiting in the exchange the receipt by the exchange resonators of the etheric notes from the cortical resonators.

It will be seen that, quite apart from any detailed hypothesis as to the substance and structure of the psychic brain, the conceptions of the mnema and the exchange give a fairly rational and coherent account of the phenomena of hypnosis. So far then these phenomena appear to support our main hypothesis, and at the same time to throw light on the normal working of the mind.

SUMMARY

The theory of the mnema and the exchange appears to give a good account of hypnotic phenomena.

The effect of suggestion, which is a potent agent in normal life is greatly enhanced in the hypnotic state.

By submitting himself to the hypnotizer, the subject assumes towards him an emotional attitude of submission to authority.

All avenues of approach to the subject's mind are closed, except as suggested by the hypnotizer.

The condition of a " blank mind " is produced, which is

readily receptive to suggestion. The judex is put out of action. The mind does no independent thinking.

All suggestions act primarily upon the mnema.

Suggestions result in psychograms competent to induce thought or action and anti-psychograms competent to inhibit antagonistic ideas or antagonistic sensory impressions.

A suggestion operates with great force owing to its isolation.

Suggestion may elicit from the mnema a group of ideas which may, as it were, fill the whole capacity of the channel from the mnema to consciousness.

Suggestion may create a psychogram which will block the passage through the exchange of antagonistic sensations coming from the cortical resonators.

Suggestion may cause the mnema to transmit to consciousness hallucinatory sensations or ideas which are drawn from mnemic records.

Suggestion may excite a hallucinatory picture in consciousness, which has for the subject all the aspect of reality, the materials being extracted from the mnema.

Suggestion may create a psychogram in the mnema which will govern the operation of the exchange resonators and thereby transmit to the cortical resonators the synaptic sequences necessary to implement a suggested motor idea.

Hyperæsthesia in hypnosis may be accounted for by the increased concentration possible in the " blank mind " induced by suggestion.

A suggestion in the normal state may be so forceful as to produce hallucinatory sensations or ideas.

CHAPTER XIV

TELEPATHY

The influence of mind on mind, otherwise than through the ordinary sense channels, if it exists, is obviously of great psychological importance. The possibility of telepathy is still denied on *a priori* grounds by some who have not carefully studied the evidence, by some who have no first hand knowledge of the phenomena, and by some whom the existence of the materialistic complex renders immune to the impact of evidence. Professor McDougall, whose judgment is evidently not affected by any such complex says " I cannot attempt to present here the evidence for the reality of telepathy. It must suffice to say that it is of such a nature as to compel the assent of any competent person who studies it impartially." To present this evidence here would be to follow a side-track, but we may refer the reader to some experiments which are summarized in a short article by one of the writers to which reference may be made.[1]

Telepathy is a phenomenon with which psychologists will more and more have to reckon. It is notable that Freud, who a few years ago poured scorn on telepathy, has come to deal with it as a possibility to be taken into account. In a recent paper on " Dreams and Telepathy "[2]

[1] *Telepathy. Hibbert Journal.* April, 1922,
[2] *The International Journal of Psycho-Analysis.* Sept , 1922. Vol III, 283.

he remarks, " Psycho-analysis may do something to advance the study of telepathy, in so far as, by the help of its interpretations, many of the puzzling characteristics of telepathic phenomena may be rendered more intelligible to us, or other still doubtful phenomena be for the first time definitely ascertained to be of a telepathic nature."

He refers to " the incontestable fact that sleep creates favourable conditions for telepathy." And he adds " no one has a right to take exception to telepathic occurrences on the ground that the event and the presentiment (or message) do not exactly coincide in astronomical time. It is perfectly conceivable that a telepathic message might arrive contemporaneously with the event and yet only penetrate to consciousness the following night during sleep, or even in waking life only after a while, during some pause in the usual mental activity." All this from Freud is significant as to a change in the attitude of materialistic psychologists, and it will be seen that his observations are in accord with the hypothesis we are exploring.

From the experiments to which reference is made above and many others it appears that a necessary condition for the clear reception of a " message " is what has been called " a blank mind " in the percipient. For accuracy the mind of the percipient should be a clean slate, or in our phraseology the material brain must be at rest and the normal flow of ideas from the mnema must be arrested. Now if you will endeavour to make your mind a blank for say half a minute, the chances are 10,000 to 1 against your being able to do it. Consciousness abhors a vacuum. The writers only know one person who can succeed in this

and this person is a good telepathic percipient. But the quality is so rare that it is very difficult to find good telepathic subjects, although experiment with normal people has shown that nearly every one has a trace of the telepathic faculty. Under hypnosis the condition of a blank mind is partially secured and telepathic experiments more readily succeed. Sleep or a " day-dreamy " condition of the mind also present a receptive soil. There occur with many people " blank " moments during which a telepathic impression may slip in.

Telepathy is placed by Professor McDougall in the class of psychological phenomena for which no explanation can be found in the physiology of the material brain, but it falls naturally into place as a phenomenon depending on the psychic brain. It will be seen that the way in which we have developed our theory of the psychic brain lends itself readily to the inclusion within its ambit of telepathic phenomena. In the chapter on the transformation of ideas we were led to the view that ideas in transmission have a a real physical existence and that definite ideas were transmitted as definite notes or chords of the etheric gamut in the same way as the colours of the visible spectrum. On our theory the exchange is furnished with resonators suitable to respond to etheric waves from the cortex. They should therefore be likewise adapted to respond to the etheric waves which may carry telepathic impressions. We are therefore inclined to regard telepathic impressions as being carried by such etheric waves and received by the exchange to be passed on to consciousness in the same way as normal ideas, or, as in the case of one kind of

automatic writing, to be implemented by motor impulses through the exchange. The exchange with its resonators is in our view the organ for the reception of telepathic messages—whether ideal or verbal. There are still puzzles in reference to telepathy, not the least of which is that if telepathy is produced by radiant ether waves they do not appear to conform to the law that the intensity of the effect should vary as the inverse square of the distance. Also some relation between the agent and the percipient seems to be a necessity. There are similar problems in long distance wireless telegraphy. At present experimental facts are too few to enable us to frame a theory, but it may be that in some way a deflective agency may give a directional course to the telepathic waves, as in the recent development of " Beam " wireless. Possibly active thinking of another person may give some orientation or deflection of the course of such waves.

Whether the telepathic faculty is on the up-grade of development, or no, is doubtful. There is some evidence that in primitive man, in some savage races and even in some animals the capacity for receiving telepathic communications exists. But according to our hypothesis the communication between the cortex and the exchange is in substance telepathic, and if this be valid the exchange is an organ which for its normal purposes is a telepathic receiver. Hence the outcrop in a few individuals of a special telepathic faculty is no more surprising than the outcrop in a few individuals of an extraordinary musical faculty.

The range of etheric waves which we appreciate by our

sense organs is very small. It is curious that in the course of evolution this should be the case. The eye is sensitive to the single octave of etheric waves which correspond to the colour spectrum from red to violet. The skin is sensitive to the somewhat longer etheric waves which correspond to heat sensations and it is also affected by the shorter ultra-violet rays. But it must be assumed that for a few people the psychic brain is sensitive to the etheric waves which may carry ideas from without, and it is probable that all have some rudimentary sensibility.

Telepathic ideas may be either pure ideas or motor-ideas. The so-called automatic writing furnishes examples of both. In the case of a written message effected by motor ideas we may assume that these motor ideas impinge on the exchange and operate the psychograms for synaptic sequences for writing the letters. No ideas *per se* are transmitted. The ideas have to be spelled out from the writing. There is another case of automatic writing in which the subject has also no consciousness of the words written by his hand. In this case the ideas would be received by the exchange, translated with the aid of the mnema into words, and implemented with the aid of the mnemic synaptic sequences. The writing down of such ideas would take place in precisely the same way as if the ideas came from consciousness to the exchange. The only difference from normal writing would be that the ideas are conveyed telepathically to the exchange instead of coming from consciousness. Precisely the same machinery would be involved for the writing of the ideas after their impact upon the exchange.

Another case of automatic writing is that in which the telepathic ideas pass from the exchange to consciousness, and the words are consciously written as if from dictation. In such a case there is always the possibility that relevant ideas from the mnema may come into consciousness and may modify or render inaccurate the telepathic message. There is also the possibility that a message from a different source may cause confusion. One of the best illustrations of this kind of automatic writing may be quoted from the experience of W. T. Stead. He appears to have been one of the most sensitive of telepathic recipients, and he made many experiments with a view to elucidating the phenomena. Various examples are given in the biography by his daughter[1] which we may extract. Stead is quoted (p. 191) as remarking :

" I may say broadly that I have found the capacity of my friends to communicate with me to differ immensely ; some seem to be utterly incapable of communicating with me in this fashion. Whether it is my fault or whether it is theirs, I do not know, but when I have asked them to communicate my hand will always write as if from them—it will answer wrongly or at random ; sometimes it will write in the name of the friend to whom I appeal, messages precise and detailed, which on being referred to the person from whom they are supposed to emanate, are discovered to have no foundation.

" Nothing is more puzzling than this deception ; a cross current which continually baffles the enquirer. Sometimes a perfectly accurate communication will be received from

[1] *My Father*, by Estelle W. Stead. Heinemann.

a friend at a distance, followed by another, ostensibly from the same person, which is totally incorrect, after which a third will be received that is perfectly true ; all of the three being matters upon which I had no means of information. On the other hand there are persons who write constantly with my hand and rarely make mistakes, and when they do it is usually found, on inquiry, that the mistake was due to some thought or intention in their own minds which existed only as a thought or intention, but which was reproduced by my hand as if it were an accomplished fact. It will be seen therefore that I do not claim for the human telephone—if I may so describe my automatic handwriting —anything approaching to the mechanical accuracy of the telephone, as we have it now in operation ; but the subject is so new, the laws governing the operations of the human telephone are so little investigated, that it would be unreasonable to expect greater progress than has already been made."

If our theory that the exchange may be looked upon as a telepathic receiver is correct, it is not surprising that it should pick up messages from other sources than that expected, which might happen to be in tune, and the possibility of ideas coming in from the mnema is also not to be overlooked.

From a friend, whom Stead calls A, he was constantly in the habit of receiving messages which were usually accurate. We may quote one such message from A (p. 190) which was written down by Stead.

" I went to Waterloo Station by the 12.0 train and got to Hampton Court about 1.0. When I got out I went to

an hotel and had dinner. It cost nearly 3s. After dinner I went to the picture galleries. I was very much pleased with the painting of many of the ceilings; I was also interested in most of the portraits by Lely. After seeing the galleries I went out into the grounds. How beautiful they are. I saw the great vine, that lovely English garden, the avenue of elms, the canal, the great water sheet, the three views, the fountain, the gold fishes, and then I lost myself in the maze. I got home about nine o'clock. It cost me altogether about 6s.

"On communicating this to A, he said that everything was right with two exceptions. He went down by the 2.0 train and not by the 12.0 and got to Hampton Court about 3.0. The dinner cost 2s. 11d. which was 'nearly 3s.' and the total cost of the expedition was 6s. 3d. The places were visited in the order in which they were named."

There are accounts of further experiments which we have not space to quote, but from them it may be gathered that the words which Stead wrote passed direct from the exchange to consciousness, and that the actual writing was carried out in the ordinary way as if from dictation.

Cases of automatic writing are the easier to check and verify, but the normal operation of telepathy is probably extensive though unrecognized. Freud's conjecture that sleep may create favourable conditions for telepathy seems to be supported by the experience of an American writer, who has given the subject much attention.[1] He regards both the reception and transmission of ideas telepathically as functions of "the subjective mind." One curious set

[1] *The Law of Psychic Phenomena*. T. J. Hudson.

of experiments is founded on the observation that for therapeutic purposes telepathic suggestion is often more effective than oral suggestion. He also regards natural sleep as putting the mind into a state for receiving suggestions as effectively as induced hypnosis. He finds further that the operator can whilst awake effectively suggest to himself that whilst he is asleep he shall communicate suggestions to the sleeping patient. And he says "the conclusion is irresistible that the best possible condition for the conveyance of therapeutic suggestions from the healer to the patient is attained when both are in the state of natural sleep." He observes "It is not proposed herein to detail the many experiments which have been made with a view to testing the correctness of this theory, my present object being to advance the hypothesis tentatively, in order to induce others to experiment as I have done. It must suffice for the present to state that over one hundred experiments have been made by the writer and one or two others to whom he has confided his theory, without a single failure."

This sounds almost too good to be true, but our present purpose is to note that such phenomena fit easily into our hypothesis. If the therapeutic virtue of suggestion be conceded, as we think it must, it is not difficult to see how a telepathic suggestion operating through the psychic brain might be of greater efficiency than an oral suggestion. One of the difficulties of oral suggestion has been found by the Nancy school to be the counter-suggestions raised in the patient's mind, involving doubt as to the efficacy of the suggestion. A telepathic suggestion is unrecognized

as external by the patient and operates as an auto-suggestion.

The defect of telepathy as a means of communication, whether by automatic writing or through consciousness arises not only from the difficulty of rendering the material brain inactive but also from the crowd of active ideas in the mnema which tend to come into consciousness and may entirely swamp the telepathic impression or may cause it to be mixed with some relevant ideas from the mnema. A friend of one of the authors, who had the faculty of automatic writing, which was sometimes clearly genuine, was often in doubt whether some part or even the whole of a written message was not the product of her own mind.

It should be noted that in the hypnotic state the crowd of ideas in the mnema is kept from the centre of the picture in consciousness by the energetic suggestions of the operator. In automatic writing, in the absence of some potent suggestion, the ideas coming into consciousness may have no more energy than associated ideas drawn from the mnema and the " message " may be mixed with such ideas.

Though the perfect development of the telepathic faculty is extremely rare, experiment shows that there is a trace of it in most persons. Concordant telepathic impulses from a number of people may reinforce one another and account for the phenomena of crowd-psychology.

The form in which telepathic ideas travel and are received will depend on the idiosyncrasies both of the agent and of the percipient. Thus some percipients seem only to be sensitive to motor-ideas, such for instance as would guide them in walking to find an object, or in writing to

form words and letters without regard to their meaning. With percipients who can readily visualize, the shape of a figure is apparently received as a visual idea. The cases of apparition, many hundreds of which were investigated by Myers and Gurney, seem to fall into this class. The apparitions were of people known to the recipients, so that a few characteristic elements would draw from the mnemic record a complete image of the person indicated. In some cases the message appears to be received in words as auditory or sound ideas.[1] In other cases the communication may travel as etheric auto-chords corresponding to absolute ideas, which are converted in the exchange into appropriate words derived from the mnema. Interesting questions are raised which can only be resolved by experiment, and they are beyond our present scope.

SUMMARY

The clear reception of a telepathic communication appears to need the condition of a " blank mind " in the percipient.

This condition is more readily realized with a hypnotized subject. Sleep may also give favourable conditions.

Upon our hypothesis the normal communication between the cortex and the exchange is in substance telepathic, i.e., by means of etheric waves.

In conformity with this the exchange must be regarded as the organ for telepathic reception.

[1] The words being occasionally in a language such as Latin, which was unknown to the percipient.

Ideas transmitted telepathically may be either pure ideas or motor-ideas.

In the case of automatic writing in which the writer has no consciousness of the words written we regard the ideas as being received by the exchange and translated with the aid of the mnema into words.

The words are written with the aid of the synaptic sequences supplied by the mnema to the exchange as in normal writing.

In the case where the telepathic ideas pass to consciousness, the writing is implemented in the normal way, by conscious volition.

In this case ideas from the mnema and other telepathic ideas may mix with and modify or render inaccurate the communication.

The kind of telepathic impulses to which a percipient is sensitive differs with different subjects. Some are susceptible to motor ideas, others to auditory impressions, others to visual impressions.

In all cases the exchange appears to be the medium of reception, and the ideas are translated into thought or images or writing or action with the aid of the mnema operating with the exchange.

CHAPTER XV

EVOLUTION

In the introduction and elsewhere we have touched upon the effect of our hypothesis in relation to the validity of the Lamarckian theory. This is still a matter of acute controversy, though observations which support it are being slowly accumulated. The proposition which we desire to consider is that *Habits are the parents of Instincts*, that is to say, that habits are engrained in the " mental structure " of the organism and that the psychic structure of the germ plasm is thereby cumulatively affected. If we can regard instincts which are congenital as being the result of habits acquired in previous generations we obtain a clue to many biological facts which are otherwise inexplicable. For instance the life history of an eel would not be so puzzling.

Let us add one more quotation to those already given, in order to emphasize the importance of the conception of " mental structure." In McDougall's *Essay on Mental Evolution*, to which reference has already been made, after discussing the possibility that the rudiments of mental life may be discerned in some very lowly organisms, he observes (p. 344) :

" Such a rudiment of mental life being postulated, we may legitimately attempt to describe how in successive

stages it may become developed and differentiated into the more discriminating perception that excites in the animal a more definitely directed impulsive or instinctive action. Such advance implies the development of *mental structure*[1] in the species; a structure which is in the lower animals almost wholly innate in the species, that is to say instinctive."

Further on he speaks of (p. 346)

"the innate mental dispositions, the racial *mental structures*[1], which express themselves in instinctive behaviour. . . . All mental process is both instinctive and intelligent; it is instinctive in so far as it is determined by innate *mental structure*[1]; it is intelligent in so far as it involves adaptation to the particular circumstances of each occasion, circumstances not provided for in the racial *mental structure*[1]. . . . The young animal acquires a store of experience, builds up a complex *mental structure*[1] corresponding to those varying features of its environment which are most closely connected with its instinctive pursuits. The young bird or mammal, during its period of youth, while its instincts are still maturing and not firmly set, learns, under the guidance of pleasure and pain, to make many discriminations not provided for by its innate or instinctive *mental structure*."[1]

Further on p. 348:

"Thanks to this gradual accumulation of experience during youth, the bird or mammal begins its independent adult life with a large store of acquired knowledge, a *mental structure*[1] differentiated far beyond the point to

[1] Our Italics.

which the differentiation of the racial *mental structure*[1] has attained. And since the nature of this acquired knowledge or *mental structure*[1] varies with each individual according to the particular circumstances under which its youth has been spent, the higher birds and mammals exhibit in their behaviour a much greater individuality and adaptability to a much wider range of circumstances than do the lower vertebrates and the insects."

It will be observed that the phrase " mental structure " occurs nine times in the above quotations and with two different meanings. There is (1) that which is inherited and which he speaks of as innate or racial mental structure which is born with the individual organism and which is the source of instinct and there is (2) that structure which is " built up " by experience during the life of the organism. The innate mental structure must find its origin in the structure of the germ plasm which gives rise to it. The " built up " mental structure is built up during life in the structure of the organism. We connect these two by the conception of a psychic structure which pervades not only the organism but also the germ plasm. In the view we put forward it is the same basis of mental structure which transmits, instincts and registers experience.

On the hypothesis which we put forward " mental structure " is not a mere metaphorical expression. As has been explained, we have been led to postulate a psychic organ with a definite psychical structure in order to account for the performance of certain functions for which physiologists were able to find no adequate material organization

[1] Our Italics.

in the human brain. We have endeavoured to show that this conception gives a more adequate account of human psychology than other theories, and that the principle of continuity in relation to observed facts would lead us to infer such a structure even in lowly organisms. In order to realize the formation of habit we have to postulate a psychic structure capable of being modified by experience and it is reasonable to infer that such psychic structure registers both instinct and habit and also pervades the germ plasm.

We have carried the conceptions of " mental structure " and an " immaterial substance " which is capable of " permanent psychical dispositions " a stage further than the authorities we have quoted, that is to say, we have postulated a real psychic structure which is physical, though immaterial. To concretize the hypothesis and formulate it more definitely we have developed the idea of psychons as the basis of such a structure. But we may consider the effect of our main hypothesis upon the Lamarckian theory without encumbering it with the speculative detail of psychons, and will refer to this structure merely as a psychic structure ; premising, however, that this psychic structure interpenetrates the protoplasmic structure and is a real physical structure though immaterial. We conceive the substance of this structure to be the psychical analogue of protoplasm, and we may call it psychoplasm. As protoplasm is capable of forming complex material structures which may carry hereditary factors, so also is psychoplasm in our view capable of forming complex psychical structures which may carry hereditary factors.

Protoplasm is an open network 99.99 % of which is "empty space." We conceive of the psychic structure as also an open structure occupying a minute space in the protoplasmic network, but just as coherent and continuous as the protoplasmic structure, both being bathed in the surrounding ether. We may conceive of every living cell as having a psychoplasmic structure as well as a protoplasmic structure.

Let us consider first whether congenital instincts should be considered as being engrained in the protoplasmic structure of the organism or in its psychic structure, or possibly partly in one and partly in the other. Congenital reflexes may in many cases be considered as embodied in physiological structure, but where there is a psychic factor in instinct it may be more proper to consider it as part of the psychic structure of the organism.

Lloyd Morgan (*Habit and Instinct*) has made a special study of the instincts and habits of chicks. He has pointed out how the congenital instinct, which is usually imperfect, is quickly modified by experience. He came to the conclusion for instance that there was a congenital co-ordination of motor responses for pecking at a small object within a suitable distance, but that the selection of certain of these objects and the rejection of others was a matter of individual experience. It may also be noted that in his view

"Experience is a mental product. Only in so far as the events of practical life are symbolized in consciousness can they be effective for guidance and control. And here it is absolutely essential to grasp this truth ; that *throughout*

its whole range, from the earliest glimmerings of sentience to the highest products of human idealism, the environment in mental development is of itself of the psychical order. If this truth be not grasped, all attempts at solving the problems of mental evolution are inevitably foredoomed to failure. . . . If experience is itself a mental product, it is in terms of mental products and in these alone that it must be explained."

In terms of our hypothesis, the results of experience, which are of the psychic order, are lodged in the psychic structure of the organism and any such lodgments may broadly be regarded as psychograms. But the psychic results of experience are built as a superstructure upon the congenital instincts, and the question arises whether congenital instincts and reflexes which precede experiences are part of the physiological or part of the psychological make-up of the organism. On such a matter, as to which at present there is very little experimental evidence, it would be futile to dogmatize. But various considerations point to the possibility that congenital instincts may be ingrained in the psychic structure of the organism. According to our theory the acquisition of habit depends upon the formation of psychograms in the psychic structure, and there is good ground for the conclusion that extension of congenital instinct into acquired habit involves the psychic factor, or, in terms of our theory, involves the development of psychograms in the psychic structure of the organism. If this be so, there seems no sufficient reason to shrink from also attributing congenital instincts which involve a psychic factor to psychograms in the psychic structure. The

economy of hypothesis would lead to the placing of both congenital and acquired characteristics upon the same structural basis at all events where they involve a psychic factor.

We regard it therefore as probable that instincts may be in the main engrained in the psychic structure of the organism. It is easy to conceive of certain reflexes as being engrained in protoplasmic constituents, and it is not easy to distinguish some instincts from physiological reflexes. But, broadly speaking, where an instinct appears to involve a psychic factor we should be inclined to regard the instinct as being part of the psychic constitution of the organism. On this view an instinct involves two distinct features—a protoplasmic organization of nerves, muscles, etc., through which the instinct can be implemented and a psychoplasmic organization through which external or other stimuli operate to direct the instinctive movements. This involves in the constitution of the organism two "concomitants"

(1) a protoplasmic structure and

(2) a psychoplasmic structure,

the two interacting as explained in earlier chapters.

We may possibly regard the psychic factor as the controlling element at all stages during the life of an organism, and the extrapolation of this hypothesis from the amœba to the case of every living cell gives a simple and consistent view of ordered growth. Every living cell would on this hypothesis contain not only a protoplasmic but a psychoplasmic constituent, immaterial, yet having a structure perhaps even more complex than the accompanying protoplasmic structure. Such a psychic structure might carry

not only the congenital instincts but the determinants which would govern the growth and development of the protoplasmic structure.

One objection to the theory of the inheritance of acquired characters has been based upon the difficulty of framing a reasonable hypothesis as to the method in which somatic modifications might be conceived to affect the germ plasm. But upon the view now adumbrated a psychoplasmic constituent would pervade all the cells of the organism, and in this way every secretion would be affected including the germ plasm itself. The germ plasm would no longer be conceived of as living an isolated life independent of the soma. The soma would no longer be conceived of as the mere husk enveloping the kernel. The germ plasm would be regarded as being constantly fed and renewed from sources which, themselves carrying psychic modifications, might introduce such modifications into the psychic structure of the germ plasm.

Registration of habit in the organism we have attributed, in Chapter VI, to the formation of psychograms in the psychic structure of the organism, to which we referred as the mnema. Registration of instinct we refer to correlated changes in the psychic structure of the germ plasm to which we may refer as germinal psychograms. Such germinal psychograms are in our view determinants regulating the growth and development of the organism from the germ plasm.

It may well be that the effect of changes in the psychic structure of the organism upon the psychic structure of the germ plasm meets with a resistance which is necessary for

racial stability. But, if little by little, psychic modifications of the organism do affect the germ plasm even to a small extent, we have a mechanism which will account for the genesis and advance of instinct, and which will give substance to the observation of McBride that "habit is response to environment, and that inherited structure is nothing but the crystallization of the habits of past generations."

Such resistance of the germ plasm to the influence of acquired modifications is even more necessary in the case of somatic modifications, otherwise it would be possible that mutilations, or "dints" upon the organism, might become heritable. We are not primarily dealing with the heritability of somatic modifications, such, for instance, as relate to organs, limbs, bones, coloration, etc., but it is not unimportant to notice that there is evidence that some somatic modifications do affect the germ plasm and become congenital factors. If such somatic acquired modifications can become heritable by modifying the protoplasmic structure of the germ plasm, it is easy to see that the case for modifications of the psychic structure of the germ plasm becomes strengthened. For the alleged difficulties in the way of rationalizing the modification of the protoplasmic structure of the germ plasm by acquired modifications are far greater than in rationalizing the modification of the psychic structure.

As an illustration we may consider the instincts and habits of certain trap-door spiders. They make a burrow with a circular opening which is closed by a circular door, with a bevelled edge which exactly fits the opening and

is camouflaged on the outside with moss or the like which matches the surrounding surface vegetation. The lid closes automatically with a spring, owing to the threads which form the hinge being so disposed as to be in tension when the door is open. Some species make branching burrows, separated from the main burrow by internal doors. One species arranges the inner door to a branch burrow in such a way that when it is not blocking the side burrow it closes the main burrow. We have not space to describe the use of these doors by the spider when attacked, but it displays resource and intelligence of a notable kind. The point we wish to make is that it is difficult to see in the whole picture a merely protoplasmic inheritance of a mechanical kind. Nor is it possible to be satisfied with the idea that the final form of the burrow is the result of casual variations of a protoplasmic germ plasm. But the conception of a psychical structure in the organism, which in each generation has registered small trial-and-error improvements together with a psychical structure in the germ plasm which has been modified by such individual experiences, appears to be much more satisfactory and therefore more scientific. Any attempt to exclude the psychic factor results in a theory which is more incredible than the psychic theory.

It may be observed that the phyletic evolution of organs and limbs of the body of an organism may be expected to proceed on quite different lines from the evolution of structures, such as nests, which are external to the organism. The origin of species by gradual variations and mutations of limbs and organs and skeletal features is not difficult to

conceive of as depending on protoplasmic germinal variations. And one can readily see that the non-heritability of somatic " dints " may be of great importance as regards racial stability. But the case seems quite otherwise where the psychic element is involved and especially in the case of a structure external to the organism. How can we think of the inheritance of the habit of building a particular kind of nest as being carried by the protoplasmic constituents of the germ cells ? If it is merely a question of reflex actions, hundreds of reflexes of different kinds coming into operation in orderly sequence beginning with the making of the burrow right up to the hinging and camouflaging of the doors of the trap-door spider would be requisite. We are not considering the growth of an organism, which, however mysterious, is still something familiar. We are considering the manufacture of an external structure and whether this can be considered as the mechanical result of protoplasmic dispositions in the germ-plasm. In the manufacture of the structure we cannot dispense with the psychic element and still less can we do without the psychic element in considering what must have been the gradual evolution of such a structure. The contrivance of a door to a burrow, bevelled to fit accurately, camouflaged with moss, shutting with a spring, and the extra burrow with an extra door serving a double purpose present a hopeless puzzle, unless we regard these things as the cumulative results of the experience of generations. And experience is a psychic matter requiring a psychical structure for its enregistration. Can we reasonably suppose that such a habitation has been evolved as the result of chance varia-

tions in the germ plasm? We can envisage the gradual adaptations made as the results of experience of trial-and error methods resulting in the elaboration of the final structure, if we can conceive of a method by which the results of experience could be stored up and handed on. We know of the like development of human habitations from the primitive wigwam to the modern house fitted with all the appliances of civilization, and we know how the experience has been accumulated as the result of "social inheritance." But we cannot attribute the house architecture of trap-door spiders to such a cause, and we seem driven to attribute the result to the summation of experience from generation to generation. Such a summation takes place in the life of every individual when a fraction of acquired habit is added to congenital instinct. And if we attribute a like summation, even in a small degree, to inheritance through the psychic factor of the germ plasm, we get a reasonable explanation. The elaboration and improvement from generation to generation, resulting in a house of which any spider might be proud, seems clearly to involve transmission of experience by a psychic factor in the germ plasm which can carry "permanent psychical dispositions."

The non-recognition of the psychic element in the registration of habit and experience has led to explanations based purely on physiological structure. But are such explanations strong enough to bear the weight which is put upon them? We have already quoted McDougall's view (Chapter V) that the higher processes of remembering depend on "psychical dispositions each of which is an

enduring feature of the psychical structure." The registration of habit and experience should be referred to the same category in the absence of adequate physiological reasons to the contrary. A mere prejudice against the recognition of the psychic factor should not lead us to accept inadequate physiological explanations.

We have already considered in Chapter VI the view that habit consists in "the establishment of permanent nerve paths of least resistance," and have given reasons for coming to the conclusion that this is a very inadequate account of the matter. We arrived at the conclusion that this theory would involve the creation for the writing habit of hundreds of permanent paths of least resistance, and for all the habits of a lifetime many thousands of such permanent paths, and that the notion of a permanent lowering of the resistances of thousands of synapses would introduce confusion into the synaptic system and incapacitate it for the purpose of voluntary ideo-motor activities.

The physiological theory seems also very inadequate to explain the Pavlov experiment, shortly described at the end of Chapter VI, relating to the establishment of a conditioned reflex in mice, which is one of those which tend to show that acquired characteristics involving a psychic element are heritable. The experiment has not been confirmed but it will serve to illustrate the predisposition to physiological explanations which are inadequate. Bayliss cites this as indicating that "the predisposition to the development of a conditioned reflex may be inherited." This of course is mere verbiage, but he is not concerned with the structural features involved, whereas we are endeavour-

ing to consider the structural mechanism involved in the registration of a "predisposition," which in our view consists in the registration of a psychogram in the organism which also affects the psychic structure of the germ plasm. The theory of Lloyd Morgan seems to be a variant of the "nervous paths of least resistance" theory. He suggests,[1] if we understand him aright, that the unconditioned reflex response to food and the conditioned response to bell are inherited as "initially permeable brain routes," which we take to mean the same as "nervous paths of least resistance." In the case of the unconditioned reflex it may be that there is a congenital physiological reflex path. In the case of the conditioned reflex it appears to be assumed that there is an artificially created reflex path—the product of experience. These two routes are supposed to be connected by "a secondary brain route of acquired permeability," which finally associates bell and food directly. It is difficult to picture the physiological expression of these routes. It appears to us that the explanation of conditioned reflexes which we suggest in Chapter VI is much more probable. The creation of the psychical record which we envisage as a psychogram in the organism would in our view produce corresponding gradual changes in the psychical structure of the germ plasm of a heritable character. The inheritance of "tendencies" or "predispositions" on our hypothesis takes place through the psychoplasmic structure of the germ plasm and not through its protoplasmic structure.

As another example of suggested protoplasmic structure as embodying a psychic feature, we may return to the habit

[1] *Evolution in the Light of Modern Knowledge*, p. 145.

of avoiding nasty caterpillars which experience superposes upon the congenital pecking instinct of the chick. There must obviously be some registration of the experience, by which the visual stimulus given by the nasty caterpillar inhibits the pecking action which would otherwise result. When the chick learns by experience to restrain its pecking instinct in the case of nasty caterpillars it is suggested that this " pre-awareness " is exercised by means of a loop line in which controlling cells intervene between the receptor and effector by which the instinct is implemented.

We may observe that this account of the enregistration of habit in protoplasmic structure is just as much speculative and theoretical as our account of the matter in terms of psychical structure. It must be judged in terms of probabilities and of relevant facts. So far as we are aware there is no evidence that experience can create a cellular controlling structure operating in a loop-line, nor does it seem in the least degree likely. The " nervous paths of least resistance " theory of habit has at least some superficial plausibility. But it hardly seems likely that the converse idea of a loop path of occasional control by an interposed cellular resistance is a probable theory. We are unable to conceive of the creation of any physiological mechanism by which controlling cells can be interposed between the receptor (the eyes) and the effector (the pecking muscles). Nor can we conceive of any purely physiological mechanism which could differentiate between a grain of corn and a nasty caterpillar, so as to bring the " loop-line " into operation in one case and not in the other On the other hand the theory of an anti-psychogram in

the psychic organ—the mnema—which is not invented in order to account for the " pre-awareness " of the chick—gives a good account not only of this phenomenon, but of a whole group of allied phenomena.

Let us consider, for instance, the hypnotic phenomenon involved in the suggestion that the subject will not be able to see a particular person, to which reference is made in the chapter on Hypnosis. According to our theory the suggestion implants in the mnema an anti-psychogram of which the exciting tag is the visual impression of the invisible person. The visual impression reaches the retina and tends to excite the resonators of the exchange but it forms the mnemic tag which brings into operation the anti-psychogram which prevents the visual excitation of the exchange from reaching consciousness. No loop-line theory would account for this transient result satisfactorily.

To apply this to the case of the " pre-awareness " of the chick, we should say that the experience of nasty caterpillars operates by suggestion to induce an anti-psychogram in the mnema. When the tag of the sight of the nasty caterpillar is present, the impulse of the pecking instinct from the effector is inhibited by the anti-psychogram and the receptor is therefore not excited.

This case is an illustration of the inadequacy of the protoplasmic theory of the registration of habit, whilst the theory of the formation of a psychogram in the psychic structure seems adequate, not only for the particular case but for a wide range of cases.

The conclusion to which we seem to be driven is that, in the case of habits and instincts which involve a psychic

factor, attempts at a purely physiological explanation of their registration are inadequate. Such explanations seem to amount merely to verbal speculations which give no real clue to the intimate mechanism by which they can be supposed to be effected. The nervous system with its synapses is an organization by which voluntary control of ideo-motor action is secured, but there is nothing to show that its protoplasmic structure is in any way adapted to the registration of habits involving a psychic factor. Permanent physiological registrations would appear to interfere with the normal use of the nervous system for voluntary ideo-motor action. But the registration of habits and experiences in a controlling psychic structure leaves the fundamental instrument intact for voluntary movements, and satisfies the concept of " mental structure " to which experts have been driven by a consideration of the problem as a whole.

If then we are led by various considerations to the conception of a psychic structure as part of the constitution of an organism, and if habits must be considered as being enregistered in this psychic structure, it is easy to see that the conception of such a psychic structure as part of the constitution of the germ plasm, which is modified by changes in the psychic structure of the whole organism, provides a ground for rationalizing the inheritance of habit in the form of instinct.

We may refer to some of the actual evidence in regard to the heritability of acquired modifications. And we may observe in passing that if we reject the *a priori* view that " one cannot see how somatic modifications can affect the

structure of the germ plasm," the whole story of instinctive life seems to be available as evidence for the gradual summation of experience by inheritance. But there are some actual experiments which tend to break down this *a priori* nescience. As to purely somatic modifications the experiments of Kammerer with salamanders, Durkhen with caterpillars and Tornier with goldfish, appear to show clearly that when there is a physical or somatic response of the organism to its environment, the new characters acquired are to a considerable extent heritable. If they are only to a small extent heritable, the continued influence of the like environment on successive generations would render them more pronounced and more stable. The results of another striking experiment in the same direction by Dr. J. W. Heslop Harrison and Dr. F. C. Garrett were given at the Conversazione of the Royal Society on the 16th June, 1926. They showed two series of Lepidoptera " to illustrate the induction of Melanism and its subsequent inheritance." The moths at the beginning of each series were of a light buff colour, and those at the end of a dark brown approaching black. We cannot do better than quote the description given in the Royal Society Catalogue :

" In manufacturing districts many lepidoptera have become melanic recently, and it is difficult to avoid the opinion that the relation between industrialization and melanism is one of cause and effect. The insects exhibited were obtained in experiments designed to test this view. Larvæ reared from typical moths from non-melanic areas were fed (1) on contaminated food collected in a melanic district, and (2) on food artificially impregnated with salts

like manganese sulphate, known to be present in foliage in manufacturing areas. After several generations melanic moths appeared in the cultures. The melanism thus induced was found to be inherited as a Mendelian recessive. The result is of extreme importance as proving that the germ plasm can be affected by environmental influences."

With reference to the heritability of psychic modifications of the individual we may cite the recent experiments of McDougall with reference to rats, an account of which was given at the British Association meeting in 1926. He is by no means prejudiced in favour of the Lamarckian hypothesis as shown by the concluding paragraphs of his recent Essay on "Mental Evolution," in which he says (p. 353):

"But since at present the Lamarckian hypothesis is out of favour, for lack of any conclusive evidence in its support, and because of the difficulty of conceiving how the modifications acquired by the parent can be transmitted through the germ plasm, we have to leave it unused. But to reject, tentatively or wholly the Lamarckian hypothesis is not to rule mind out of the account as a creative agency. . . . These considerations should lead us to attach much importance to those forms of selection in which mind does seem to play an active part, more especially sexual selection, organic selection, and various forms of social selection (involving isolation and co-operation). Taken together these various forms of mental selection may be supposed to have played no inconsiderable rôle in the drama. But it remains difficult to see in them, as in natural selection itself, anything more than pruning agencies which may have shaped

the course of evolution, but not have created new forms. The only remaining possibility of assigning to mind the creative rôle which would seem to be proper to it (so long as the Lamarckian hypothesis is untenable) is to assume that the germ plasm itself, or the reproductive cells, have enough of mental activity to produce the variations upon which all selective processes must be supposed to operate and without which they can produce no evolution."

The hypothesis which we have been expounding does not suggest "mental activity" in the germ plasm, but a psychic constituent which may profit by the mental activity of the organism. But we can equally assign to mind a "creative rôle" if we attribute variations not to the "mental activity" of the germ plasm itself, but to the mental activity of the organism affecting the psychic structure of the organism and thence the psychic structure of the germ plasm. But we cite the above passage chiefly to indicate that McDougall does not start with a bias in favour of the Lamarckian theory, though he is moving in that direction.

His account of his recent experiments we take from *The Times* of 11th August, 1926. He observed that the Lamarckian hypothesis "had for some time been regarded with disfavour by scientists, who did not understand how the germ plasm could be affected by the individual, and acquired characteristics be thus transmitted; but, not having himself regarded the evidence against it as conclusive he determined some years ago to embark on an experiment designed to give positive or affirmative results. This experiment was begun six years ago, and white rats

were chosen for it. . . . The experiments had now extended through 17 generations of rats, three generations being dealt with each year."

Briefly two avenues for escape from a tank were provided and the test was to find out how soon on the average the rats learned to avoid the dangerous exit. The descendants of rats which had gone through the experiences for 17 generations were compared with those which had had no such experiences. Young rats three weeks old were chosen, 138 from the " trained " ancestry and 234 from the " untrained " ancestry, the comparative results being as follows :

	Trained		Untrained	
	Safe exit	Unsafe exit	Safe exit	Unsafe exit
1st day	76	62	114	120
5th ,,	71	67	119	115
10th ,,	67	71	111	123
15th ,,	78	60	111	123
20th ,,	97	41	118	116
25th ,,	105	33	118	116
30th ,,	115	23	126	108

It is clear that the rats from the trained stock showed a marked preference for the safe exit after the 15th day. At the 30th day the trained stock were getting great benefits from their hereditary experiences, whilst the untrained stock were just beginning to profit by the experience of 30 days. Professor McDougall proposes to continue the experiments which even so far he regards as giving strong evidence in favour of the Lamarckian theory.

We have pointed out that the impression of a psychogram may depend on time and repetition. In the above experiment the formation of a habit psychogram in the untrained rats was only beginning to be apparent after the 25th day, but the impression of an incipient instinctive or germinal psychogram after training through 17 generations seems to be clearly indicated.

We submit that the considerations set out in this chapter afford a sufficient ground for the *prima facie* rationalization of the Lamarckian hypothesis. No doubt those who are strongly affected by the Weissmann complex will continue to advance ingenious theories to account on an anti-Lamarckian basis for the results of experiments such as those cited above. But if, as we submit, the conception of a psychic structure in the organism and in the germ plasm is justified by general physiological and psychological considerations this should help to neutralize the *a priori* objections which lead to the interpretation of every experiment and observation on heredity in a sense opposed to the Lamarckian theory.

SUMMARY

If acquired habits can affect the germ plasm, we may regard Habits as being the parents of Instincts.

The registration of habits and experiences implies the building up of a "complex mental structure."

On our hypothesis this "mental structure" is a real

structure of psychoplasm interpenetrating the protoplasm of the organism.

If, as we postulate, this psychonic structure is a component of every living cell, including the germ plasm, there is no *a priori* difficulty in conceiving that habits registered in psychoplasm may impress the germ plasm.

We may regard congenital reflexes which involve no psychic factor as being embodied in protoplasm.

But we regard congenital instincts which involve a psychic factor as being embodied in psychoplasm.

Psychoplasm may possibly carry not only congenital instincts, but determinants which would govern the growth of protoplasm.

Changes in the germ plasm correlated with changes in either the protoplasm or the psychoplasm of the organism probably meet with considerable resistance which is necessary for stability.

But there are cases of somatic acquired modifications which affect the germ plasm, and this strengthens the case for the heritability of psychoplasmic modifications.

It is difficult to attribute the structure building of (say) the trap-door spider to purely protoplasmic registration in the germ plasm.

It is also difficult to attribute the perfection of such a structure to anything but the summation of experience from generation to generation.

The non-recognition of the psychic element in the registration of experience leads to inadequate alternative theories.

The theory of habit as " the establishment of permanent

nerve paths of least resistance " has no secure physiological basis. The theory of conditioned reflexes and " predispositions " or " pre-awareness " as involving a " secondary route of acquired permeability " or an acquired nervous " loop line " is also speculative.

The theory of psychograms in the mnema induced by suggestion (as with hypnotic phenomena) appears much more probable.

The conception of a psychoplasmic structure which also pervades the germ plasm in which experience is registered with correlative results in the germ plasm gives great support to the Lamarckian theory.

The experiments of Kammerer, Durkhem, Tornier and Harrison and Garrett support the view that acquired somatic modifications are heritable.

The recent experiments of McDougall support the view that psychic acquired modifications are also heritable.

The theory of inheritability of habit above set forth seems to remove *a priori* objections to the Lamarckian hypothesis.

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